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INDICATIONS FOR OPERATION

In Disease of the Internal Organs.

INDICATIONS FOR OPERATION

IN DISEASE OF THE INTERNAL ORGANS.

BY

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Authorized English Translation

BY

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TRANSLATOR'S PREFACE.

Professor Schlesinger's reputation as a clinician and writer is in itself sufficient explanation for this translation. The subject of his treatise is admittedly one of the first importance. Now that the activities of surgery are so far-reaching, the question of the indications for operation is one which is constantly presenting itself to the practitioner, and one which is often very difficult of decision. The object of this volume is to aid in the settlement of such problems, and I have undertaken its translation because it appears to me eminently to succeed in its purpose.

K. W. Monsarrat.

Liverpool, *July*, 1906.

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AUTHOR'S PREFACE.

I HAVE been induced to write this book by the fact that practitioners have frequently expressed to me a desire to possess some concise work, which would serve as a guide in determining the necessity for surgical intervention in diseases of the internal organs.

I have written essentially for the practitioner. I have, therefore, avoided all prolix discussion, and confined myself to the consideration of the questions indicated by the special design of the work. On the advice of colleagues, whom I have consulted, I have included in each chapter some remarks on etiology, pathological anatomy, clinical course, diagnosis, and differential diagnosis, with a view to enabling the practitioner to quickly obtain a general grasp of the condition under consideration. These paragraphs are, however, subordinate to the main purpose of my undertaking, that of enabling medical men, who are not in hospital practice, to arrive at an independent opinion on the advisability of operation in cases of internal lesion. I do not claim, however, to have given separate consideration to all the internal affections which have been submitted to operation from time to time.

To avoid misconception, it must be stated, that the references to literature at the end of each chapter are given only with the idea of assisting the reader to consult the authorities quoted; in many instances articles equal in importance to those cited are omitted for want of space.

The reader must not entertain the idea that this is a mere compilation. Many years' work in hospital and private

practice have given me the opportunity of acquiring a large experience in the questions which are discussed in this book, and on this experience I have largely drawn in writing it. There should be some advantage in the circumstance, that a Physician who is in full sympathy with the standpoint of the Surgeon, here presents to the Practitioner a discussion of the question of surgical intervention.

HERMANN SCHLESINGER.

Vienna.

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CHAPTER I.

Diseases of the Brain and its Meninges.

INDICATIONS FOR OPERATION.

Chapter I.

DISEASES OF THE BRAIN AND ITS MENINGES.

TUMOURS OF THE BRAIN.

Etiology.—Of greatest importance in determining the etiology of brain tumours are the presence of primary new growths in other parts of the body, and the discovery of syphilitic lesions in the skin, mucous membranes, or some other locality. The existence of tuberculosis, especially in the lungs, a history of severe trauma to the head preceding the cerebral symptoms, the discovery of the cysticercus or of a hydatid cyst in some organ, are all likewise etiologically significant.

Pathological Anatomy.—Brain tumours may be primary or secondary. Surgical treatment concerns itself of course with the primary growths only. One of the most common types, the glioma or gliosarcoma, occurs primarily only in the brain ; sarcomata may be primary or secondary. Cerebral tuberculosis is almost always associated with tuberculosis elsewhere ; the gumma usually co-exists with syphilitic changes in the meninges. Carcinoma occurs only as a metastasis, and is not infrequently multiple ; the latter is true also of tuberculosis and gumma, whereas the sarcoma and the glioma are usually solitary. Sarcomata usually show a sharp differentiation from the surrounding brain tissue, and tubercular lesions are also commonly circumscribed, but the gumma is seldom well defined, and the glioma diffusely infiltrates the surrounding brain substance. Not infrequently gummata originating in the meninges make their way into the brain substance in such a manner that they appear to have started in the latter. There is rarely any true extension of meningeal tumours into the brain substance, and still less frequently does this

occur in the case of tumours originating in the cranial bones. These latter are often metastatic in origin, secondary to sarcomata and carcinomata of the thyroid, mamma, adrenal, prostate, or ovary, and sometimes attain to very large proportions. The sarcomata are often remarkably vascular.

With regard to situation, the cerebral hemispheres are most commonly the seat of new growths, next the cerebellum and the pons. Solitary tubercular lesions occur characteristically in the two latter situations, while the glioma is most frequent in the brain.

Tumours of the posterior cranial fossa are often associated with the development of pronounced internal hydrocephalus. Sometimes the surrounding brain substance is markedly altered in contour by the compression of a new growth, and softening often occurs. Cranial nerves may be compressed and destroyed. The cranial bones are frequently thinned; in two cases under my own observation, however, the calvarium over the tumour was enormously thickened.

Clinical Course.—The symptoms of brain tumour fall into two categories, the general and the localizing. Of the first, the most constant and important are intense headache and the presence of double optic neuritis. Symptoms of importance, but less constant than the above, are drowsiness, intellectual dullness (a striking delay in answering questions), general convulsions, vertigo, vomiting, a slow pulse, and transitory loss of consciousness.

In many cases these general symptoms are the only ones present; but in others there are, in addition, signs which are characteristic of the situation of the lesion. Such phenomena may be due to a lesion directly provoked by the growth in a certain area, or by the influence of the tumour on its immediate surroundings (the "vicinity" symptoms of Oppenheim and Bruns), or by its effect on more distant regions of the brain. Occasionally the site is revealed by a definitely localized tenderness on skull percussion.

Characteristic focal symptoms are found when the tumour is situated in the Rolandic region. In such cases typical attacks of motor Jacksonian epilepsy may occur (p. 28), preceded frequently by attacks of sensory cortical epilepsy affecting the same area in which the motor convulsions later appear. In the early stages transitory paralytic symptoms

are present ; in the later stages they become persistent. Often at the beginning they are of a monoplegic type, becoming hemiplegic in course of time. The convulsions occur first in the paralytic muscles ; the senses of touch and of position are frequently much interfered with in the paralysed areas.

The tumours of the third left frontal convolution give rise to a motor aphasia which declares itself early, but becomes complete only by slow degrees. Tumours of the other parts of the frontal lobes present no such characteristic symptoms, but a diagnosis may sometimes be arrived at ; frequently an unsteadiness of gait is present, resembling the ataxia of cerebellar disease (Bruns). The intellectual powers are often markedly dull. Optic neuritis is frequently a late symptom and not uncommonly unilateral. In some cases there is localized percussion tenderness, and, according to Bruns, a tympanitic note may be elicited over the affected area. The diagnosis of frontal tumour is further confirmed when, following on the above symptoms, or of hemi- or monoparesis, there supervene, in later stages, signs of general feebleness of the trunk muscles, or of cortical epilepsy, or deviation of the head to one side with rigidity of the neck and conjugate deviation of the eyes.

Growths of the left temporal lobe are often associated with sensory aphasia (this appears in the case of tumours of the right temporal lobe when the subject is left-handed) ; sometimes convulsions are in such a case preceded by aural premonitory symptoms. In the late stages hemianopsia, hemianæsthesia, and hemiparesis are sometimes found.

A tumour of the occipital lobe may, in addition to the general symptoms, give rise to a crossed hemianopsia, with absence of the hemiopic pupil reaction. The diagnosis obtains confirmation if symptoms of ocular irritation and psychic phenomena appear. The presence of hemianopsia, alexia, and optic aphasia in combination point, according to Bruns, to a lesion of the left occipital lobe. A bilateral lesion of the occipital lobes gives rise to general mental dullness.

Tumours of the superior parietal lobule often occasion defects of sensibility, notably of the sense of position and of the stereognostic sense ; these may be associated with ataxia, which is in this case probably a direct result of the

lesion (Oppenheim). Signs of motor irritation and paralysis are not uncommon. Deep-seated tumours of the inferior parietal lobe may occasion hemianopsia ; alexia and optic aphasia are only associated with such growths when they are left-sided.

Tumours of the cerebellum give rise directly only to the two symptoms ataxia and vertigo. Symptoms due to compression of the surrounding parts are usually absent when such growths are situated dorsally, but are common in basal tumours. When they occasion unilateral paralysis of the fifth to the twelfth cranial nerves the tumour is usually to be found on the same side as the paralysis ; and the same holds for the associated paralysis of the abducens. Signs of cerebral compression appear early, and convulsions with opisthotonus are frequent (Oppenheim).

Diagnosis.—The diagnosis of a cerebral tumour can be established in the majority of cases. Severe persistent headache which resists treatment is always suspicious. If with this there co-exist double optic neuritis, dulling of the intellect, and vomiting during the height of the attack, then the presence of tumour is very probable. Certain other general symptoms assist in arriving at a correct opinion—vertigo, slowness of the pulse, alterations in the urinary secretion, and epileptiform attacks, particularly if there is a steady increase in their severity, and if attacks become gradually more frequent.*

The diagnosis of situation is more readily made when progressive focal signs have been present for a considerable period. If optic neuritis is absent, its appearance must usually be awaited before a positive diagnosis is possible. A fact of practical importance is, that signs of irritation and paralysis referable to lesions of the Rolandic region are usually due to tumour. The onset of general symptoms is to be expected later in the case of growths of this region than elsewhere, and consequently the less importance is to be attached to their absence (Bruns). With regard to the diagnosis of tumour in other situations, reliance must be

* Sometimes the disease shows itself abruptly in a condition of otherwise good health; such an onset has several times come under my own observation. In two such cases the tumour made its way outwards and was palpable under the scalp.

placed on the above described symptoms, always remembering that only well developed symptoms should be relied on ; the successive development of phenomena must also be carefully studied, and the local signs on the skull must be compared with those other which appear to indicate the site of the growth.

Further mention must be made of these cranial indications. The most important are, strictly localized headache corresponding with defined tenderness to percussion, the occurrence of tumour-like protrusion of the skull, and the presence of the cracked-pot sound. This last sign, whose importance has been lately emphasized by several competent observers (Macewen, Bruns, Oppenheim), is more frequently present in children. In adults I have failed to find it in twenty cases ; if it is present, and corresponds with other focal signs, it is of great importance. In several cases circumscribed tenderness to percussion has enabled a diagnosis to be made at an early stage. If the skull is eroded by the tumour, and the latter presents as a palpable fluctuating swelling (as especially occurs in cases of hydatid cyst), a diagnosis of situation can, of course, be made at once.

This apparently definite local sign, the erosion of the skull, may, however, occasionally give rise to some confusion in diagnosis, for a bone tumour may co-exist with and even correspond in position with a cerebral tumour beneath, or a growth of the dura may exhibit a similar relationship. Two such cases have come under my own observation. The first was that of a woman, aged 52, who came into hospital in a condition of marked stupor, with complaint of only occasional headache, no convulsions, and normal pulse. There was slight exaggeration of the tendon reflexes on the right side, but no motor or obvious sensory disturbances, and the cranial nerves were normal. Immediately before death the left optic disc was blurred, and for a few days before this a rapidly progressive hemiparesis of the right side of the body made its appearance. Six years before, a recurrent fibro-sarcoma of the abdominal wall had been removed, and, in view of this, great importance was attached to the presence of a tumour situated in front of and above the left ear, of bony consistence and the size of half a plum-stone ; this was looked upon as a bony metastasis pressing on the frontal

lobe. The general condition of the patient precluded surgical treatment. At the necropsy a large sarcoma of the frontal lobe was found, and, situated exactly over but quite distinct from this, an exostosis of the skull.

The second case was a man, aged 26, complaining of severe occipital headache, excessive rigidity of the neck, and frequent vomiting. From time to time he had attacks of stupor, and tonic contractions of the muscles generally, with opisthotonus. The cranial nerves were unaffected, except the left hypoglossal (deviation of the tongue to the left) and the optic. As far as could be ascertained there was left homonomous hemianopsia. At the upper part of the occipital bone on the right side there was a large flattened protrusion very sensitive to pressure. Double optic neuritis rapidly progressed to atrophy. The diagnosis was made of tumour of the bone or dura over the right occipital lobe. Death occurred suddenly. The necropsy demonstrated an endothelioma of the dura mater over the right occipital lobe, with pronounced erosion of the skull, and, in addition, a large glioma of the right occipital lobe with a recent hæmorrhage into it.

The discovery of a vascular bruit will lead to the diagnosis of aneurysm, or of a highly vascular growth (sarcoma) ; the co-existence of tuberculosis, of syphilitic lesions, of a primary malignant growth, or of the echinococcus or cysticercus elsewhere, will indicate the probable nature of the intra-cranial lesion.

Differential Diagnosis.—So long as a tumour gives rise to general symptoms only, there is considerable probability of its being confused with other morbid conditions. Optic neuritis narrows the limits of possible error, and if this co-exist with persistent headache and stupor, these limits are further circumscribed. Sometimes the differentiation from cerebral abscess (p. 17) is very difficult. In addition to what is said on the subject elsewhere, abscess sometimes, in my experience, gives rise to optic neuritis in its early stages. This is, however, undoubtedly exceptional.

Fever is not an exclusive sign of abscess ; it may also exist in cases of tumour (in tuberculosis, more rarely in carcinoma), especially in children with tubercular lesions elsewhere. In a case which was for several weeks under my observation, and in which an affection of the frontal lobe

was suspected, irregular fever was present for some weeks. At the autopsy a diffuse glioma infiltrating the convolutions of the right frontal lobe was discovered. A most careful examination, carried out by Prof. Weichselbaum, failed to reveal any other lesion to account for the fever.

More rarely there arises a difficulty in differentiating between tumour and sinus thrombosis (q.v.).

Oppenheim has rightly remarked that the differential diagnosis between tumour and acquired hydrocephalus can hardly ever be made with certainty, especially as the latter affection very often complicates tumour. He has enunciated the following points in favour of hydrocephalus: the characteristic hydrocephalic shape of the skull, a duration of several years, and the absence of well-marked focal symptoms.

Of greater practical importance is the probability of confusion with general paralysis, especially when the latter exhibits in its early stages the characters of cortical epilepsy. Optic neuritis will exclude general paralysis, and complete reflex immobility of the pupil is rarely present except in cases of tumour. In the late stages of tumour, and especially of multiple tumours, the symptoms may closely resemble those of general paralysis. I have seen a case of cerebral tumour, operated on with good result, which had been diagnosed as general paralysis by several distinguished physicians. The examination of the fundus oculi revealed the presence of optic neuritis, and this led to a correct diagnosis.

When a tumour is associated with convulsions at an early stage, a differential diagnosis from ordinary epilepsy has to be made; the presence of other symptoms will facilitate this, in particular optic neuritis, which is not found in ordinary epilepsy. The phenomena of Jacksonian epilepsy which is not caused by tumour (e.g., that due to softening or scar formation), do not show, as a rule, the tendency to progression which is found in tumour.

Uræmia may give rise to symptoms resembling those of cerebral growth. Headache, vomiting, slowness of pulse occur in the course of both affections, and renal disease may give rise to optic neuritis, with swelling of the disc. On the other hand, a brain tumour may cause albuminuria. The presence of renal epithelium in the urine will always point

to the probability of uræmia, although the possibility of the simultaneous development of a renal inflammation and a cerebral tumour must be borne in mind, and has occurred in several instances which have been under my observation.

Multiple sclerosis is rarely likely to be confused with tumour; it is distinguished from the latter by the absence of optic neuritis, persistent headache and stupor, by the absence of percussion-tenderness of the skull, and by the presence of definite spinal phenomena.

INDICATIONS FOR OPERATION.

Operation may be undertaken :—

1. For the radical extirpation of the growth.
2. For the relief of symptoms by some palliative procedure.

Indications for extirpation are met with only in a restricted number of cases. They may be said to be present when the diagnosis of tumour is definite, when localization is possible, and the tumour is in a situation accessible to the knife. Eradication is possible when the tumour is circumscribed and of moderate dimensions. With regard to accessibility, Bruns has placed the different parts of the brain in the following order : (1) The Rolandic region ; (2) The speech centres ; (3) The frontal lobes ; (4) The occipital lobes ; (5) The temporal lobes. These are also the areas, lesions of which may be diagnosed earliest and most definitely, and when the signs of tumour are clear the prognosis of operation is relatively good. With regard to tumours of the cerebellum, although they are often accessible, the results of operations for their removal have been hitherto so bad that one is forced to agree with Oppenheim and Bruns, that operation is not advisable in most cases. Operation is also inadvisable when the tumour is situated in other situations than those enumerated above, and at the base ; the prognosis *quoad vitam* is, at present at any rate, most unfavourable. It is usually impossible to be sure beforehand whether a tumour has originated in brain, meninges, or bone ; from the point of view of operation this point is unimportant, if its situation as regards the brain can be definitely ascertained, nor will a supposed subcortical position of the tumour in the regions mentioned alter the indications for operative interference.

With regard to the diagnosis of the nature of a growth,

and the bearing of this diagnosis on operation, the following considerations should be borne in mind. When tuberculosis is discovered in some other organ of the body, and pyrexia is present, the cerebral tumour is probably also tubercular ; as a rule, however, tubercular foci are not single, and sometimes co-exist with diffuse changes in the meninges and cord. In spite of the latter facts, however, my own experience agrees with that of Krönlein and other authors, that under certain circumstances brain tubercle ought to be operated on (*a*) When there are no signs of widely diffused tuberculosis in other organs and the general condition of the patient is good, and when the pyrexia is not high ; (*b*) When symptoms of meningitis and spinal disease are absent ; (*c*) When the symptoms point to a single focus.

If the symptoms of tumour are preceded by those of syphilis, if tertiary lesions have presented themselves elsewhere and the diagnosis of cerebral gumma is practically certain, surgical measures will only be undertaken under certain conditions, on which my own opinion coincides with that of Friedländer ; they are as follows ; (1) When the symptoms are progressive in spite of energetic specific treatment, and threaten life ; (2) When the tumour remains stationary after a course of treatment, and the focus is easily accessible and to all appearance of small dimensions ; (3) When symptoms of Jacksonian epilepsy persist after the earlier tumour symptoms have disappeared. Even when these conditions are present operation is contra-indicated when there are (*a*) Signs of basal or advanced spinal syphilis ; (*b*) Pronounced cachexia, and the presence of amyloid and other serious complications in internal organs.

When the diagnosis of a metastatic growth is made, operation is seldom justified. It is indicated : (1) When the primary tumour has been removed, and there are no clinical signs of other metastases ; (2) When the symptoms give cause for the belief that the brain tumour is single and situated in an easily accessible region ; (3) When the general condition is good.

The presence of multiple growths, when this is known before operation, or definitely suggested by the symptoms, is an absolute contra-indication to radical operation. A diagnosis of multiple tumour must not, however, be founded on a discovery that the disease is of a type which usually

gives rise to multiple lesions of the nervous system (tubercle, gumma, cysticercus, etc.).

With regard to the size of a tumour there are rarely exact data, and if other indications for operation are favourable, the supposition that the tumour is of large size should not be allowed to weigh against them.

The earlier operation is undertaken, the more favourable are the chances of complete extirpation. This consideration must not, however, lead one to recommend operation until a definite diagnosis has been reached; but, *as soon as the general and local diagnosis of a cerebral tumour has been made, when syphilis and tubercle have been excluded, and when the possibility of surgical intervention has been decided, then operation should be undertaken without delay.*

Palliative operation for cerebral tumour is indicated in the absence of focal symptoms, when signs of cerebral compression are prominent, and the latter is giving rise to insupportable suffering. It is especially indicated when the patient is suffering agonizing headache, and when an optic neuritis is present which threatens to proceed to atrophy; in several cases blindness has been thereby averted. Operation is also called for in the presence of frequent general convulsions.

Such palliative operations comprise lumbar puncture, and opening of the skull, with eventual puncture of the ventricle. We have now a considerable number of observations on lumbar puncture in cerebral tumour, which go to show that the procedure is not without risk. Lichtheim and Fürbringer have published four cases of death following immediately after lumbar puncture, and others have since been reported. I have had a similar experience, which I related, some years ago. A young man, with signs of tumour in the occipital lobe, developed symptoms of severe intracranial pressure (marked slowing of the pulse, vomiting, agonizing headache, and Cheyne-Stokes respiration). Internal medication was useless, and lumbar puncture was performed. After the drawing off of a few cc. the headache became insupportable, and stupor came on, followed by convulsions. He died twenty-four hours later. The autopsy revealed a recent hæmorrhage into a glioma of the right occipital lobe.

In other cases (for example in one on whom I performed

lumbar puncture four times) a certain amelioration of some of the symptoms takes place. The operation is indicated when in the presence of symptoms of severe intracranial pressure trephining is refused, and when optic neuritis shows signs of passing into atrophy. If there are indications that the tumour is very vascular, lumbar puncture is contra-indicated. It must be performed with great care; the rapid escape of fluid must be prevented, and the operation be at once abandoned: (*a*) If the pressure is very low at the beginning, or rapidly becomes so; (*b*) If marked embarrassment of circulation and respiration supervenes.

Opening the skull has frequently been resorted to during the last few years for the relief of intracranial pressure. If the brain bulges into the opening and so prevents the free escape of fluid, and if the signs of compression persist (which may not always be the case), puncture of the ventricle is indicated; by this means even well-established focal symptoms due to inoperable neoplasm may be arrested. I am able to cite a very instructive case illustrative of this fact. A young man developed convulsions of the type of cortical epilepsy several months after an injury. Under treatment with bromides the symptoms disappeared for two years. There then supervened status epilepticus, stupor, marked optic neuritis, severe headache, and left hemiplegia. The skull and dura were opened over the Rolandic area, and a large hernia developed here, covered only by the soft parts. Although nothing was done to the prolapse the paralysis improved considerably, the convulsions ceased, and the headache and optic neuritis disappeared. The patient was able to resume his occupation for several months. His symptoms reappeared suddenly, and he died shortly afterwards. Post mortem a huge gliosarcoma was found infiltrating the whole of the right hemisphere. The growth of the tumour had evidently continued, yet after the operation the general and focal symptoms had markedly improved. (*v. Neurol. Centralb.*, 1895, p. 702, and 1898, p. 974.)

In a case under my care of basal tumour, the result was disappointing. The skull was opened, and the bone replaced; the latter promptly healed. Neither the optic neuritis nor any other symptom was improved by the operation.

Prognosis.—Regarding the prognosis of the operation, the numerous ill-successes of recent years have made one more circumspect. About 6 per cent of cases fulfil all the conditions for direct surgical intervention, but in 3 to 4 per cent only is complete ablation and cure achieved. Tumours of the Rolandic region offer the best prognosis, because they can be diagnosed the soonest and with the greatest certainty. The operative treatment of tumours in other situations is attended with less success, and the prognosis of operable tumours of the cerebellum is worst of all.

Operative interference may be directly responsible for death; Oppenheim placed the mortality of operation at 37·7 per cent. Again, much more severe symptoms may follow operation than those which the tumour gave rise to; in particular, more extensive paralysis. In one of my own cases a complete motor aphasia supervened, which disappeared only after a lapse of several months; another case developed marked cortical ataxia. As a rule, lesions caused by operation reach their maximum intensity at first, and afterwards gradually improve. A steady increase in the severity of symptoms after complete extirpation, such as would be produced by encephalitis, appears to have very rarely occurred. The possibility that the operation may give rise to pronounced paralysis should not be allowed to influence one against recommending it, for the tumour itself is a definite menace to life.

The prognosis if no operation is undertaken.—If in the face of the indications which have been given, no operation is done, internal medication offers little chance of success. Sometimes, in non-syphilitic cases, large doses of potassium iodide and mercurial injections have appeared to cause some amelioration of symptoms for a time, but complete cure by medical treatment is a very rare event. Spontaneous recovery by calcification of the tumour is also extremely unusual. Death is, therefore, to be expected when operation is not undertaken, and when no palliative operation is done the symptoms will show steady progression.

Risks of operation when the diagnosis is faulty.—Opening the skull is not an operation free from risk. Fatal hæmorrhage from the diploic vessels has been recorded, and traumatic encephalitis and œdema of the brain may occur.

Sometimes a persistent hernia develops, or Jacksonian epilepsy from meningeal adhesions. Opening of the skull with chisel or trephine should, therefore, only be undertaken when the diagnosis of tumour is clear.

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CEREBRAL ABSCESS.

ETIOLOGY.—Cerebral abscess almost always occurs as a secondary lesion. The most important etiological factors are: (1) Affections of the ear; (2) Injuries of the skull; (3) Diseases of the nose; (4) Metastatic lesions (especially following putrid affections of the lungs and general sepsis); (5) Chronic cranial suppurations. The first two of these are by far the most frequent. Of ear affections, those in question are purulent otitis media and mastoid disease.

PATHOLOGICAL ANATOMY.—Cerebral abscess may be acute, subacute, or chronic; as a rule it is single; metastatic abscesses alone are wont to be multiple. The acute abscess originating by continuity from some neighbouring focus is usually superficial; the chronic abscess usually more deeply situated. With regard to localization, those originating from some traumatic lesion usually develop superficially at the site of injury; otogenic abscesses are found especially in the temporal lobe and cerebellum; the rhinogenic in the frontal lobes; and those which follow bone disease usually in the immediate vicinity of the affected bone. These abscesses may reach the size of an apple or larger. The

meninges are regularly involved in traumatic abscess, and frequently in the otitic. In the ultra-acute type an acute suppurative cerebrospinal meningitis is often present ; in the subacute form the meningitis is usually local, with adhesions to the brain surface, but sometimes there is a serous meningitis with abundant serous exudate. Otitic abscesses are sometimes complicated by thrombosis of the lateral sinus and extradural abscess. Old standing abscesses may become encapsuled ; they may extend later and burst even after several years' duration.

Clinical Course.—An abscess may run a latent course throughout. In other instances symptoms of general and of cerebral disturbance are present : headache, vertigo, local tenderness of the skull, stupor, slowness of pulse, convulsions, and delirium. The temperature may be raised, and frequently there are rigors ; the absence of fever is, however, not rare (Macewen). Optic neuritis is more frequent, especially in the subacute cases, than was at one time thought. Of the focal symptoms (which often first appear at a late stage) the following are the most important :

In temporal abscess, sensory aphasia and double hemianopsia of the same side. In many instances (Oppenheim) as a characteristic sign, the so-called " optic aphasia " is present, that is to say, the patient cannot name objects shown to him. In the later stages, when the process advances rapidly, hemiparesis of the opposite side of the body appears, with convulsions of the character of cortical epilepsy.

In frontal abscesses there are often no localizing signs, even when they are of large size. Sometimes there is ataxia resembling that of cerebellar disease, and certain peculiar psychical disorders. In the late stages a rapidly progressing hemiplegia of the opposite side appears. Optic neuritis often appears only towards the end.

Abscesses of the motor region give rise to paralysis, often of monoplegic type, and attacks of cortical epilepsy.

In cerebellar abscesses there are observed sometimes slight rigidity of the muscles of the back of the neck, occipital headache, vertigo, and inco-ordination.

Occipital abscesses often give rise to bilateral homonomous hemianopsia. The skull is sometimes sensitive to percussion over the affected area.

Diagnosis.—A correct diagnosis is often possible. It is usually based first on the discovery of a septic focus in some part of the skull, especially the ear and the frontal sinus, or in some other part of the body, notably the bronchi; secondly, on the presence of fever, rigors followed by sweating, signs of a rapidly progressing affection, increasing intracranial pressure (optic neuritis, paralyses, sensory or optic aphasia, hemianopsia), headache, vertigo, convulsions, percussion-tenderness of the skull, *bruit de pot fele*, and vomiting.

Localization is often beset with considerable difficulty. "The greatest certainty in the diagnosis of otitic abscesses is reached when symptoms are present which can be assigned to the involvement of some region of the brain, in which such abscesses are known to be commonly found" (Körner).

In regard to differential diagnosis, it is of especial importance to be able to distinguish otitic brain abscesses from otitic extradural abscesses (pachymeningitis externa purulenta), sinus thrombosis, and purulent cerebrospinal meningitis. The clinical picture may be of the same type in all these affections.

By lumbar puncture information may be obtained as to the presence of meningitis. If the affection develops from one to two weeks after an injury, and if focal symptoms and signs of meningitis are present together, then there is probably an abscess in the cortex. When there is torticollis, tenderness and infiltration along the jugular vein, and other signs of thrombosis, then thrombosis of the lateral sinus will be diagnosed; œdema and tenderness over the mastoid process will confirm this. These two last signs are also evidence in favour of the presence of an extradural abscess. A point of considerable practical importance is the fact that a simple suppurative mastoiditis may be the cause of severe cerebral symptoms, probably by setting up a serous meningitis.

In distinguishing abscess from tumour, the presence of fever is important; in tumour there is usually no rise of temperature. In abscess, also focal symptoms appear at a relatively late period; in fact, they usually mark the beginning of the end.

In children with tubercular lesions, glands, etc., if fever supervenes, the possibility of a cerebral or meningeal tuberculosis should be considered.

INDICATIONS FOR OPERATION.

Whenever there are definite clinical signs of intracranial suppuration, operation is called for without delay, whatever the origin of the abscess may be. The only exceptions will be when there are signs of diffuse purulent cerebrospinal meningitis, and when the general condition is extremely bad owing to some other intercurrent affection. An exact topical diagnosis, although of course of great advantage, should not be considered absolutely necessary. The original seat of the septic affection is of great importance as a guide to the probable situation of the abscess and the operation. Otitic abscesses are usually found in the temporal lobe of the cerebellum; abscesses secondary to nasal disease in the frontal lobes.

If suppurative ear disease is present, accompanied by cerebral symptoms, which do not, however, with certainty point to abscess in the brain, operation should be undertaken, and this may reveal a septic focus in the mastoid, or an extradural abscess. In such cases the only contra-indications to operation will be the presence of severe acute sepsis, involvement of the ventricles, and the presence of diffuse purulent meningitis as revealed by lumbar puncture. Operation should still be undertaken when there is doubt whether one has to deal with a purulent meningitis or a brain abscess. The earlier the operation the greater the chances of recovery. Even when an exact topographical diagnosis has been made the abscess may not be discovered at the operation, or a second abscess may be overlooked.

Prognosis.—*If operation be undertaken.*—Körner's statistics, dealing with 212 otitic brain abscesses, show recovery in 50 per cent; in 55 cerebellar cases there were 52 per cent successes. In many cases recovery from paralysis and speech defects have followed operation.

If operation be not undertaken.—The patient dies in a short time from rupture of the abscess into the ventricles, or diffusion throughout the meninges with consequent purulent meningitis. Only in very rare instances the abscess has discharged externally through the ear, the nose, or the temporal bone, and recovery has followed. Delay in these cases is therefore fraught with grave danger to the life of the patient.

Consequences of operation when the diagnosis is at fault.—Operation is always serious, and may be fatal, but the risks of operation are in most cases not so great that they should be allowed to weigh against intervention; the prognosis of abscess is too absolutely unfavourable to allow them to do so. Operation may give rise to traumatic spreading encephalitis, serous meningitis, or hernia of the brain.

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SINUS THROMBOSIS AND SINUS PHLEBITIS.

ETIOLOGY.—Sinus thrombosis may arise from several causes. Thrombi may form in the course of some prolonged and exhausting affection of different organs; from encroachment on or compression of the sinus by a new growth; from the spread to the sinus of some inflammatory process of the face and head; from otitis media and caries of the temporal bone; from some general change in the condition of the blood. Thrombosis of the lateral sinus complicating middle-ear and mastoid disease will chiefly engage our attention.

PATHOLOGICAL ANATOMY.—The thrombus may be local, or involve the greater part of the sinus, the latter especially in the case of the longitudinal sinus. The inflammatory thrombi are found in the neighbourhood of the primary focus; thus, in ear affections the lateral sinus is attacked, in diseases of the orbit the cavernous sinus. The thrombosis is set up either by spread of the inflammatory process to the wall of the sinus, by compression of the latter, or by direct extension through

a venule from the seat of disease (the rare osteo-phlebitis of Körner); occasionally it is due to the erosion of the sinus by new growth. Thrombosis of the lateral sinus, by far the most frequent of all forms, often extends into the internal jugular vein. Usually, when secondary to ear disease, septic disorganization of the clot occurs, and by extension of the process to surrounding structures local or diffuse purulent meningitis, an extradural abscess, or a brain abscess may follow; all four conditions may be present in any given case. When the process spreads along the internal jugular vein, the vein wall is attacked; abscesses then develop around it and deep-seated suppuration in the neck. By absorption of the septic material and disorganization of the putrid clot, pulmonary abscesses and pyæmia appear in the later stages.

Clinical Course.—Frequently thrombosis is discovered only by chance, or is masked by other symptoms. The forms which are of chief clinical importance, that is to say, thrombosis of the lateral and cavernous sinuses, are usually characterized by high fever, intense headache, rigors, a semi-conscious condition, increased pulse rate, optic neuritis (in particular unilateral), frequent vomiting, profuse diarrhœa, and irregular and sudden oscillations of temperature, with profuse sweating. After several days, jaundice frequently appears, with characteristic coloration of the urine; in this sometimes only urobilin is found. In the late stages swellings of the joints, gangrene of the lung, and other septic complications are common.

In addition to these symptoms, the following are also often observed: in thrombosis of the lateral sinus, œdema, swelling, and tenderness over the mastoid process, pain on skull percussion, and unilateral or bilateral optic neuritis. The attitude of the head (caput obstipum) is characteristic, and the patient complains of intense pain in the side of his neck. Pressure over the course of the jugular vein is painful, and sometimes the thrombosed vein can be felt as a long cord, the surrounding parts being also swollen. Active rotation of the head is usually impossible, and passive rotation is painful; nodding is usually possible and painless, according to my observation. In other cases there is rigidity of the neck, tenderness on pressure over the vertebræ, and pain in swallowing. Very rarely paralysis of the palate or

vocal cords is found ; it has not been present in any of the numerous cases I have seen. Unequal distension of the jugular vein is very uncommon.

Thrombosis of the cavernous sinus is usually accompanied by protrusion of the eyeball, œdema of the lids, or chemosis. The cerebral and palpebral veins are distended, and the forehead is cyanotic. Patients often complain, in the early stages, of pain along the frontal branch of the fifth cranial nerve ; diplopia is also present, owing to involvement of the nerves supplying the eye muscles, and sometimes immobility of the eye develops rapidly from paralysis of the oculo-motor, abducens, and trochlear nerves. Optic neuritis is frequent.

Diagnosis—When there is present one of the head affections which are commonly complicated by sinus thrombosis, such as chronic middle-ear disease, and the patient exhibits the symptoms described above, the diagnosis may be made ; it is often impossible, however, to be sure how far the meninges on the one hand, and the brain on the other, are involved. Meningeal symptoms may be simply due to irritation. In my experience much importance is to be attached to œdema over the mastoid process, the typical attitude of the head, tenderness over the jugular vein, and signs of thrombosis in it, when these are associated with phenomena of pyæmia. Sinus thrombosis is always very probable when pyæmic symptoms supervene on an otitis (Lenhart). Brieger has, however, drawn attention to the fact that phlebitis of the diplöic veins may be the starting-point of otitic pyæmia without infection of the sinus ; such cases are, however, exceptional.

Differential diagnosis.—As above stated, it is impossible in many cases to arrive at a certain diagnosis between sinus thrombosis and brain abscess, extradural abscess, or diffuse meningitis, especially since the former is often complicated by one of these. A rapid and irregular pulse, a high temperature with rapid remissions, profuse sweating and diarrhœa, frequent rigors and pyæmic symptoms, point to sinus thrombosis. The intellectual faculties often remain unclouded to the last stages. The early appearance of a transitory motor aphasia, the presence of pus and the formation of a coagulum in the fluid obtained by lumbar puncture, are in favour of a diagnosis of meningitis.

Hemianopsia and optic aphasia point to cerebral abscess. In abscess the temperature is usually only moderately high, the pulse is slow, and the intellectual faculties dull.

It should be remembered that tenderness on pressure along the course of the jugular may be due to other inflammatory lesions, such as lymphadenitis and abscesses secondary to cervical caries. A lymphangitis may also give rise to the formation of a tender cord-like swelling in the neighbourhood of the jugular vein, and may complicate mastoid disease without the sinus being involved.

INDICATIONS FOR OPERATION.

Sinus phlebitis has often been operated on with success*, frequently when pyæmic symptoms have commenced, and thrombosis of the jugular is established. Operative interference is therefore indicated in all cases of uncomplicated sinus thrombosis (see paragraph above) unless severe complications are already present in other organs and the patient's vitality is greatly depressed. Although it is impossible to be certain before operation whether the lesion is confined to the sinus, yet this must not be allowed to weigh against operation if the two contra-indications just mentioned are absent. Operation is equally indicated if it is thought probable that the sinus phlebitis is complicated by cerebral abscess, or extradural abscess, or circumscribed meningitis. The earlier the operation, the better the chances of success. Commencing jugular thrombosis is no contra-indication.

Sinus phlebitis is so often undiagnosed that it is advisable in all cases of extensive operation for acute purulent ear-disease to open the lateral sinus on diagnostic and therapeutic grounds.

Contra-indications to operation are severe pyæmia, multiple metastatic foci in distant organs (e.g., the lungs)§, gangrene of the lung following septic and gangrenous infarct, endocarditis, nephritis, pyæmic arthritis, jaundice.

If lumbar puncture reveals the presence of purulent cerebrospinal meningitis, no operation should be undertaken

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* In 305 cases of operation collected by KÖRNER, 180 recovered and 125 died.

§ A solitary pulmonary abscess is no absolute bar to operation, but can rarely be diagnosed clinically.

(recently some authors have urged operation in these desperate cases on the ground of an occasional success). If there is reason to believe that there is phlebitis of the cavernous as well as the lateral sinus, operation is almost always contra-indicated on account of the extent of the lesion.

Tuberculosis of the mastoid process or the temporal bone, with consecutive sinus thrombosis, does not contra-indicate operation, unless the general condition of the patient is very bad, or advanced tuberculosis is discovered in other organs. No operation should be done in carcinoma of the temporal bone.

PROGNOSIS.—*Of operation.*—The figures which have been quoted above show that the prognosis is relatively good; the more favourable the earlier the operation. Two out of five operated on died.

When no operation is undertaken, the results of sinus phlebitis are in general very bad. In most cases the disease is rapidly fatal. Exceptionally, however, a case of advanced sinus phlebitis has recovered without operation.

Risks of operation when the diagnosis is faulty.—The danger attached to opening the sinus is comparatively small. Fatal air aspiration has been recorded once (Kuhn); infection through the wound of the sinus is rare.

The trauma entailed by the operation of opening the skull may set up a traumatic encephalitis, but this is very exceptional.

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HYDROCEPHALUS.

ETIOLOGY.—The general etiology of hydrocephalus need not be discussed here, for only a few of the forms of the condition are suitable for surgical treatment; acute hydro-

cephalus, due to serous or tubercular meningitis, or to cerebral tumour, is not, in my opinion, included among these. Operation is called for in the chronic congenital type, but not in the chronic acquired form, such as that following closure of the foramen of Magendie or the foramen of Monro, or that due to tumour, for the reason that a differential diagnosis between the latter and cerebral tumour is hardly possible, and consequently the chances of successful surgical treatment are of the smallest. In such cases the most that can be done is a palliative operation for the relief of intracranial pressure, prolonging a miserable existence for a short period.

Pathological Anatomy.—Bergmann's definition gives in a few words the essential points. He says: "Chronic hydrocephalus is characterized by a progressive increase of the fluid in the ventricles of the brain, and by a corresponding distension of the skull of the child, whose sutures and fontanelles are still unclosed." The amount of fluid in the ventricles is sometimes enormous, the cortex and the rest of the brain being extremely thin and diffusely atrophic, the floor of the third ventricle forming a cystic swelling. The sutures gape and the fontanelles are greatly enlarged, the forehead bulging forwards. The structures at the base of the brain appear compressed. The fluid in the ventricles is similar in composition to the cerebrospinal fluid. The circumference of the head is much greater than normal, and the bones of the skull are not unusually thin and transparent.

Clinical Course and Diagnosis.—In addition to the signs already mentioned, a few others only require to be noted in regard to the question of diagnosis. The face appears small, the position of the eyeballs is modified by the narrowing of the orbits, and the hair is scanty; often nystagmus and tremors of the face are to be noted, and optic neuritis or a simple optic atrophy. The intellectual faculties are often feeble, and definite dementia is not uncommon.

Often the head cannot be held upright; sometimes motor paresis of the upper and lower extremities is present, often associated with spastic phenomena or tremors. The tendon reflexes are much exaggerated, and in advanced stages general convulsions occur.

Differential diagnosis.—The differential diagnosis from rachitic changes in the skull is of special importance, these being only part of general bone changes throughout the skeleton. In rickets the skull is square, and craniotabes is not uncommon. A very pronounced increase in the size of the skull negatives simple rachitis, while favourable results from the administration of phosphorus are evidence in its favour.

It is also important to distinguish the congenital from the acquired form of hydrocephalus. The most important point is the fact that in the latter the enlargement of the head does not date from the first few months of the child's life. If the evidence on this point is not clear, assistance may be obtained from a history of meningeal symptoms having preceded the enlargement of the head ; if this is the case it will point to the acquired form.

INDICATIONS FOR OPERATION.

Operation does not necessarily follow on a diagnosis of congenital hydrocephalus ; the condition may spontaneously come to a standstill. When the increase of the head is rapid and continuous, and the signs of intracranial hypertension become prominent (slowing of the pulse, Cheyne-Stokes respiration, vomiting, and intellectual dullness), and if general convulsions make their appearance, then the question of operation must be considered. Generally speaking, operation is justifiable when the condition endangers life : such an operation may be either lumbar puncture or drainage of the ventricles.

Another indication for operation arises when optic neuritis or commencing atrophy threatens total blindness ; and, thirdly, when there is intense and persistent headache.

Operation has been undertaken of late years in the hope of improving the bodily and mental functions which suffer so severely in the course of the disease, and with a view to improving the hydrocephalic dementia, using the latter term in its widest sense.

Contra-indications.—Operation should not be undertaken if prolonged antisyphilitic treatment or the administration of phosphorus has brought about an arrest in the progress of the condition, or a disappearance of the symptoms of raised intracranial pressure. Operation must be looked

upon as by no means free from risk. It will not be recommended when the general condition is very low, when there is marked dementia, when optic atrophy is complete, or when the child is suffering from some other severe complicating affection. Even when operation is well borne, the good local results are liable to be outweighed by persistent intellectual defect, idiocy, and imbecility. Chronic stationary hydrocephalus should not be operated on when the skull is completely ossified; no improvement would follow under such circumstances.

Prognosis.—*After operation.*—This will vary according to the mode of intervention. Spinal puncture, if done with the necessary precautions, is not particularly dangerous, but what improvement it causes is only temporary, and it has to be frequently repeated to obtain a permanent result. It can only be successfully done when the aqueduct of Sylvius, the foramen of Magendie, and the other channels are patent. The operations by which fluid is evacuated directly from the dilated ventricles are all attended with risk, and only a few cases have been benefited or cured thereby. In sixty-five cases collected by Henschen there were twenty-four fatalities; in twelve there was no improvement, sixteen were cured, and thirteen improved. Probably many unfavourable cases are not reported, and there is reason to believe that the mortality is higher than these figures represent. Drainage of the ventricles gives the worst results of all; of twenty-three cases thus treated, sixteen died.

The operations which have been hitherto devised for hydrocephalus (especially ventricular drainage) must therefore be considered of very doubtful utility; but at the same time it cannot be denied that definite cure *may be* obtained by these means.

Consequences of operation.—Operation may be followed by fatal septic infection (meningitis, abscess). Spinal puncture alone may occasion serious and even lethal syncope, owing to a too rapid and abundant escape of fluid; it is well to repeat, therefore, that it is attended with definite risks. When a palliative operation is undertaken, with the idea of rescuing the patient from complete blindness, the least dangerous, that is to say spinal puncture, should be chosen.

Prognosis without operation.—The hydrocephalus itself

may become stationary, while marked motor and intellectual symptoms persist (an unusual event), and the damage to the sensory nerves, especially the optic nerves, progresses. On the other hand the hydrocephalus may increase and produce symptoms of progressive intracranial tension, with or without intercurrent complications, bringing about a fatal result in the course of time. This may be a few months or several years.

Spontaneous recovery may take place, but the chances of its occurrence are small in any given case. Sometimes the fluid finds an exit by the nose, throat, or orbit ; then recovery may follow if no secondary infection intervenes. About a dozen cases of spontaneous rupture are recorded in the literature.

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EPILEPSY.

DEFINITION, ETIOLOGY, AND PATHOLOGICAL ANATOMY.—By the term epilepsy is understood a condition characterized by frequently recurring attacks of sudden loss of consciousness, with general convulsions, at first of tonic, and later of clonic, type. In habitual epilepsy generally speaking, an idiopathic, a symptomatic, and a reflex type are to be distinguished, although this distinction is not always possible.

To the symptomatic type belong those cases in which gross anatomical cerebral lesions (hydrocephalus, tumour, abscess, extensive softening) or diseases of other organs, such as the kidneys, are associated with epileptic attacks in addition to other symptoms. Reflex epilepsy is that form in which convulsions of epileptic type are set up by some discoverable irritation of the peripheral nervous system ; in such cases, it must be noted, that a state of

pathological excitability of the central nervous system is also present.

In idiopathic epilepsy no constant and characteristic anatomical changes have yet been found, but among other lesions the following have been most frequently observed: old cicatrices, circumscribed cysts, local sclerosis, hæmorrhages (traumatic), bone splinters, and hyperostoses. There are many cases in which no anatomical anomalies are found.

The most important etiological factors in epilepsy are the intoxications (alcohol, lead), the infective diseases (syphilis, malaria), heredity, psychic influences, and head injuries.

Clinical Course.—Epileptic seizures are of several different types: (1) The "petit mal"; minor attacks without or with only slight convulsive movements, but with loss of consciousness. (2) The major attacks, with prodromal symptoms of the nature of an "aura," with loss of consciousness, first tonic and then clonic convulsions of the whole muscular system, initial cry, and biting of the tongue, followed by stupor and drowsiness, and sometimes by psychic disturbances. (3) The partial seizures (cortical epilepsy, Jacksonian epilepsy), in which, after a prodromal "aura," the convulsions either chiefly or exclusively affect one side of the body and then pass off, usually in the order in which they appeared.

If the convulsions, first tonic, then clonic, are confined to one side, consciousness is usually unaffected; if they spread to the opposite side it is usually lost. The attacks of the second and third types often appear in series. When the attacks succeed each other with great rapidity, a status epilepticus is established.

Diagnosis and Differential Diagnosis.—When the attacks are well marked the diagnosis is readily made. They will be distinguished from hysteria by the biting of the tongue, the serious injuries which the patient sometimes suffers in an attack, and by the complete loss of consciousness. Incontinence of urine and fæces during an attack, and the occurrence of the latter during sleep, point to true epilepsy. Hysterical phenomena and hysterical convulsions will enable one to distinguish hysteria from an apparent "petit mal." Symptomatic epilepsy may be distinguished

from idiopathic epilepsy by the presence of anomalous phenomena not characteristic of the latter, at any rate after one has had the patient under observation for some time.

INDICATIONS FOR OPERATION.

These have been very differently stated at different periods. At the present time the following may be given :—

Reflex epilepsy.—Operation is called for when the diagnosis of a reflex epilepsy is clear ; that is to say when the attacks are dependent on some peripheral lesion (a tumour, a painful cicatrix), as shown by the fact that the aura makes its appearance in the latter, with twitching of the neighbouring muscles, and spreads thence to the rest of the body, and when the attacks can be set up by pressure at the seat of the lesion. Such operation will consist in the removal of the disease focus (tumour, scar, hyperostosis).

Symptomatic epilepsy.—The indications for operation will here be guided by those relative to the tumour, abscess, or other condition to which the epileptic attacks are due. In this type, as also in *Idiopathic epilepsy*, the skull should be opened when there is a history of a trauma shortly preceding the onset of the convulsions. Operation is absolutely indicated in recent cases in which there is a palpable lesion, such as a depression of the bones of the skull, or in which there are one-sided convulsions associated with other marked cerebral symptoms. It is also indicated in cases of somewhat longer standing, in which there is definite cortical epilepsy constantly commencing at a definite spot on one side of the body, and when there is an " aura " referred to that part in which the muscular twitchings first occur. In all such cases, however, operation will only be undertaken when a course of treatment with bromides has been tried and found ineffectual.

Contra-indications to operation.—In reflex epilepsy, the generalization of the convulsions over the whole muscular system in each attack negatives the idea of operation. When this is the case it indicates the existence of such pronounced changes in the central nervous system as to make it probable that even after removal of the original irritative cause the convulsions will continue.

In idiopathic epilepsy, operation is contra-indicated when there are no local symptoms enabling one to diagnose the

site of a local brain lesion, when convulsions are not one-sided, when no bone depression or exostosis is manifest in a case presenting the history of a trauma, and so on.

Simple trephining of the skull at some point or other, which was at one time frequently practised, often produces a transitory improvement, but no permanent good result. For resection of the sympathetic, which has been done in many cases more recently, no favourable curative results can be claimed.

In cortical epilepsy, when operation reveals no apparent abnormality of the cortex, no resection of the latter should be done, although Horsley recommended it.

In all cases where there is no history of acute onset (trauma), no operation should be undertaken for the convulsions until energetic treatment with bromides has been tried and failed. If there is a definite or even only a probable history of syphilis, an antisyphilitic course of treatment should be prescribed before recommending operation.

Prognosis.—*Risks of operation.*—In reflex epilepsy these are usually slight. They are more serious when the skull is opened, for this operation is itself always a severe one. Sensory and motor defects may persist for a long time after the removal of apparently normal portions of the cortex in hemi-epilepsy. I have seen such still existent years after operation. In every case of trephining there is a risk that the resulting scar may itself prove the cause of epileptic seizures.

Results without operation.—In reflex epilepsy the establishment of general epileptic attacks is to be expected ; this is true also for traumatic and non-traumatic cortical epilepsy.

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THE CEREBRAL PALSY OF CHILDREN.

Etiology.—This condition may be either congenital or acquired. The acquired form is caused by injuries at birth, injuries of other kinds, the infectious diseases, embolus, and thrombosis of the cerebral vessels, the latter associated specially with syphilis.

Pathological Anatomy.—No constant anatomical changes have been found; usually some process which is no longer active, the chief being foci of softening, cysts, indurations, and porencephaly. Sometimes a fine plication of the grey matter of the cortex has been found, the so-called microgyria. Thickening of the meninges and cysts of the meninges are common. Often the whole hemisphere is shrunken and sclerotic. The motor region is that most commonly and most severely affected.

Clinical Phenomena.—Hemiplegia is the characteristic phenomenon. The paralysis does not, however, remain complete, but recedes to a certain extent. It affects, as in the adult, the extremities and the face on one side, and there is often also paresis of the hypoglossal on the same side. The paralysis is of the spastic type, and contracture is in many cases a more prominent symptom than the paralysis. The reflexes are exaggerated on the paralysed side, and Babinski's sign is often present. Hemiathetosis and hemichorea are exceptionally frequent. Usually there are no sensory abnormalities. The paralysed extremities often show arrest in growth and muscular development. Epilepsy and idiocy are common, but the idiocy is not complete, and may only consist of slight weakness of intellect, or some anomalous characteristics. In many cases the condition is bilateral (cerebral diplegia).

Diagnosis.—The symptoms will render the diagnosis clear; the spastic and non-degenerative character of the hemiplegia, the intellectual weakness, the epilepsy, hemichorea, hemiathetosis, etc. As a rule it is easy to avoid confounding the condition with birth palsy (the flaccid paralysis of an arm), or poliomyelitis (degenerative paralysis).

INDICATIONS FOR OPERATION.

Trephining, with removal of the morbid focus, is indicated if epilepsy, chorea, and athetosis are present, unless some

particular contra-indication is present, such as general feebleness, heart failure, tuberculosis (Henschen). The hemiplegia will not be improved by operation, and therefore in itself is not an indication for intervention. Plastic operations on the muscles and tendons are indicated for the disabilities produced by contracture and paresis.

Contra-indications.—In addition to those already mentioned the presence of diplegia is against operation, nor should this be advised when epileptic seizures are only occasional, because, although they are sometimes improved thereby, it is by no means certain that this will follow in any given case.

Prognosis.—*Dangers and results of operation.*—Hitherto the results of trephining have not been particularly encouraging, for in some of the cases death has followed and been directly assignable to it. It must therefore be looked upon as distinctly dangerous. In another group of cases the improvement that has followed has been only transient. The attacks of muscular spasm or the epileptic seizures improve or disappear, only to return after the lapse of a longer or shorter period. Usually they appear after a few months, and sometimes worse than ever. Complete recovery is exceptional. Only therefore in cases where the symptoms (epilepsy, choreiform spasm) are extreme and intolerable, will operation be recommended : that is to say, trephining, with removal of the morbid focus.

The results of tendon transplantation are more encouraging. The function of useless limbs can be, in part at any rate, restored, and the risks of operation are minimal.

Results without operation.—When contracture, athetosis, or chorea develop, the limb will be rendered almost completely useless. The onset of epileptic fits leads up to chronic epilepsy and the danger of the status epilepticus. Generally speaking, however, the life of the patient is not endangered by his affection.

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CEREBRAL HÆMORRHAGE.

The cerebral hæmorrhage which follows injury will alone be discussed here; the spontaneous hæmorrhages of the brain have so rarely been submitted to operation, that no discussion of indications and contra-indications is possible.

Etiology.—Traumatic cerebral hæmorrhage may be occasioned by a comparatively slight as well as by a severe injury.

Pathological Anatomy.—There may or may not be a severe skull lesion associated with the intracranial hæmorrhage. Extradural hæmorrhage is usually due to tearing of the middle meningeal artery; intradural hæmorrhage usually comes from a pial vein. The clot may be very large and exert severe pressure on the brain. Multiple lesions of brain, meninges, and skull are often caused by the one injury.

Clinical Course.—It may be very difficult to decide whether hæmorrhage is intra- or extradural; in many of my cases of intradural hæmorrhage, the fluid drawn off by lumbar puncture has contained blood. As a rule there is an interval, which may be an hour or may be as long as ten days, between the injury and the onset of pressure symptoms; the patient then becomes increasingly drowsy, his pulse slows, and vomiting and convulsions commence. The convulsions may be of the type of cortical epilepsy, and may be strictly localized, e.g., to the face muscles. Hemiplegia then appears and becomes more and more pronounced, affecting the side of the body (including the face) opposite to that of the injury; hemihyperæsthesia may be associated with this. In left-sided lesions aphasia may sometimes be made out. As the hæmorrhage and the pressure increase, paresis develops on the same side as the lesion, the respiratory rhythm becomes of the Cheyne-Stokes type, the pupils become dilated, and the patient passes into a condition of coma, terminating in death.

Diagnosis.—The diagnosis is based on the appearance after injury of the symptoms enumerated; paralysis of the opposite side, cortical epileptic attacks, and the gradual increase of the signs of cerebral compression.

INDICATIONS FOR OPERATION.

The skull must always be opened when, after injury to the head, signs of progressive cerebral compression are associated with the presence of a definite lesion of the cranial vault. If no such lesion can be found, operation should still be undertaken when the signs of compression steadily advance, and when these signs are such that the site of the hæmorrhage can be diagnosed. If, however, the compression symptoms are stationary, and not of a severe type, the advice given by Allen Starr is to wait, for the reason that in many cases the paralyses clear up spontaneously by resorption of the hæmorrhage. Under such circumstances, however, the patient must be watched carefully, and if the compression symptoms increase in severity, operation must be undertaken without delay.*

Contra-indications.—If, after a head injury, signs of compression supervene without any localizing symptoms, and if no bony lesion is discoverable, there are no sufficient indications for operation. In such a case operation would only be done in the hope of finding the source of the hæmorrhage, and this hope is exceedingly unlikely to be realized.

Prognosis.—*Results of operation.*—In many cases the removal of clots, and the discovery and ligature of the bleeding vessel, have been followed by complete recovery.

Risks of operation.—These must be considered serious when an exact diagnosis of the situation of the lesion is wanting. When the site of the hæmorrhage is correctly diagnosed the risk is less.

Results without operation.—The hæmorrhage sometimes ceases spontaneously, and after remaining stationary for a long time, the symptoms in such a case may be expected to gradually disappear. If, however, the symptoms steadily become more severe, the intracranial tension increases,

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* A case was recently recorded by Saenger and Grisson in which cortical epilepsy suddenly appeared four days after a head injury; this commenced in the face and persisted. Some loss of consciousness supervened later, and operation was then done. After incision of the dura a hæmatoma overlying the central convolutions was found and removed. Recovery followed.

and the paralysis extends, unless operation is undertaken death will follow with the symptom-complex of cerebral paralysis.

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TUBERCULAR MENINGITIS.

ETIOLOGY.—This affection is almost always of a secondary character, associated especially with tuberculosis of the lungs, glands, bones, and joints.

PATHOLOGICAL ANATOMY.—The chief characteristics are the occurrence of inflammatory changes in the pia mater and arachnoid, the development of tubercles of varying size in these membranes, and the accumulation of an excessive amount of cerebrospinal fluid in the ventricles. The membranes at the base of the brain are chiefly involved.

CLINICAL COURSE.—After a prodromal stage of varying length, during which the patient suffers from lassitude, headache, and irritability, and sometimes a transitory aphasia, more pronounced signs of cerebral irritation begin to make their appearance. Such signs are : stiffness of the neck, cutaneous hyperæsthesia, inequality of the pupils, photophobia, headache, delirium, convulsions, vomiting, slowing or irregularity of the pulse. Constipation is usual, and retraction of the abdomen, and Trousseau's sign (*taches cérébrales*) may be present. Flexion of the hip with the leg extended causes considerable pain, and the legs cannot be extended in the sitting posture (Kernig's sign). A slight elevation of temperature is almost always found. After some days or weeks the patient becomes comatose, paralyses of the cranial nerves appear, the pupils do not react, and examination of the fundus oculi shows tubercles in the choroid. The pulse rate increases, and Cheyne-Stokes respiration develops. At the time of death there is often marked hyperpyrexia. The symptoms are, on the whole, very variable in their character and evolution.

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS.—The early

appearance of rigidity of the neck, and of Kernig's symptom, and examination of the fluid obtained by lumbar puncture, will clear up the diagnosis. The cerebrospinal fluid is turbid, and on standing a scum often forms, in which tubercle bacilli may be found. The diagnosis from typhoid fever (Widal's reaction), prevertebral cellulitis, acute infectious diseases with meningeal symptoms, brain tumour and abscess, and cerebral hæmorrhage, is often difficult, but is much facilitated by lumbar puncture.

INDICATIONS FOR OPERATION.

Of the different operative procedures which have been tried in tubercular meningitis (puncture of the lateral ventricles, and of the fourth ventricle, opening and drainage of the spinal canal by laminectomy, puncture of the spinal canal) spinal puncture alone appears to be justifiable. This is indicated (*a*) for diagnostic purposes; (*b*) to relieve or ameliorate symptoms of severe cerebral compression. The advice which has been given by several authors that puncture should be undertaken with the idea of gaining time for the carrying out of some curative treatment, is of theoretical rather than of practical interest.

Prognosis.—*Results of spinal puncture.*—Headache and other pressure symptoms are often markedly improved, and the patient may obtain marked relief for some hours or even days. I have often practised spinal puncture with the view of affording this relief. It is only in very exceptional cases (Freyhan), and then only by repeated puncture, that recovery or considerable prolongation of life has been obtained. Puncture must thus be looked upon only as a means of relieving certain of the symptoms.

The risks of spinal puncture are very small in uncomplicated tubercular meningitis, if too rapid escape of fluid is prevented, and if the operation is interrupted on the appearance of symptoms of collapse. It is therefore contra-indicated in a relatively small number of cases. Although lumbar puncture has been performed in a large number of cases by myself and under my supervision, I have never experienced any disagreeable accident. It is only *contra-indicated* when the patient has already reached the stage of paralysis, and when the general condition will not tolerate any interference, however slight.

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ACUTE LEPTOMENINGITIS.

ETIOLOGY.—The disease is probably always due to bacterial infection. The organisms reach the meninges either from some distant focus by metastasis, or directly from some inflammatory lesion, more or less directly in contact with the meninges, either within (brain abscess) or without. Such lesions may be in the scalp, the ear, the frontal sinus, the nasal, oral, and orbital cavities, etc.

PATHOLOGICAL ANATOMY.—The infection makes its way through lymph and blood channels, and spreads rapidly throughout the cerebral and spinal meninges. There is also a localized type. The exudation may be either serous, hæmorrhagic, or purulent.

CLINICAL COURSE.—The disease usually begins acutely, with fever, rigors, and intense headache, and vomiting. Consciousness is also often affected, and various signs of irritation appear, cutaneous hyperæsthesia, headache, photophobia, nystagmus, muscular spasm, and sometimes convulsions. Rigidity of the neck and Kernig's sign are specially important, the latter being the impossibility of extending the legs with the patient in the sitting posture. The pulse is slowed, and the pupils are unequal or contracted. Later, paralyses occur, and the pulse-rate increases, and there appear strabismus, dilatation of the pupils, paresis of a single or of all extremities, Cheyne-Stokes respiration, deep stupor, and retention or incontinence of urine. In epidemic cerebrospinal meningitis there is, as a rule, a diffuse herpetic eruption, and paresis of the ocular muscles is often an early symptom.

The serous meningitis of Quincke may run an acute or chronic course: fever is intermittent and slight, and all the symptoms are of a rather subdued type. Purulent non-epidemic meningitis, on the other hand, usually exhibits severe symptoms from the beginning, and relatively often some local symptoms. Non-suppurative meningoencephalitis often follows some acute infectious disease, and

marked irritative or paralytic symptoms are frequently observed from the commencement.

Differential Diagnosis.—The condition is to be differentiated in particular from tubercular meningitis and enteric fever. In the latter there is no slowing of the pulse and no leucocytosis, while Widal's reaction is positive. In cerebral tumour the course is apyrexic ; when the symptoms are chronic in type and local, and when definite optic neuritis is present, tumour is indicated. Septic processes in the vicinity of the meninges are often with difficulty differentiated from meningitis, and are indeed often associated with the latter. If rapid improvement takes place after the evacuation of pus, definite meningitis is probably absent. Tubercular meningitis is distinguished by the discovery of the bacilli in the cerebrospinal fluid.

INDICATIONS FOR OPERATION.

Operation may be undertaken as a prophylactic measure, or when meningitis is fully established. All accessible septic foci bordering on the meninges should be evacuated as early as possible, whether meningitis threatens or not. When intracranial pressure threatens life, or if intense and persistent pain is complained of in the head and neck, lumbar puncture should be done, and may be repeated if these symptoms reappear.

With regard to direct operative interference in meningitis by trephining, puncture of the ventricles or of the meninges, clinical experience has not yet been sufficiently great to permit of the formulation of indications.

Contra-indications.—Lumbar puncture is only contra-indicated when the patient is moribund.

Prognosis.—*Results of operation.*—Localized meningitis often disappears when the neighbouring septic focus is successfully treated. Lumbar puncture often brings about a marked relief to the symptoms of cerebral compression ; sometimes this relief is only of short duration, but the puncture may be repeated. Occasionally lumbar puncture has a curative influence.*

* Recently, in a case of hæmorrhagic meningo-encephalitis, under my care, lumbar puncture was repeated three times. Marked improvement resulted, although the patient was extremely ill, and he ultimately recovered.

Risks of operation.—If too much fluid is not removed, and it is not allowed to run too fast, the dangers of lumbar puncture are minimal, even if the foramen of Magendie is obstructed.

If no operation is undertaken, death from cerebral compression is to be expected.

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CHAPTER II.

Diseases of the Spinal Column and Cord.

Chapter II.

DISEASES OF THE SPINAL COLUMN AND CORD.

TUBERCULAR SPONDYLITIS (Pott's Disease).

Etiology.—The various etiological factors which influence the development of tubercular disease are concerned in the etiology of tuberculosis of the spinal column. Injury is an etiological factor of some importance.

Pathological Anatomy.—The disease is somewhat frequently discovered at post-mortems. Out of 35,000 autopsies at the Pathological Institute in Vienna, it was found in 420 instances. The vertebral bodies are much more frequently affected than the vertebral arches, and the process gives rise to destructive lesions by caseation and caries. When a vertebra is destroyed and those on each side are also involved, a kyphosis is developed, with an angular projection corresponding to the carious segment. The thorax and pelvis both undergo considerable secondary changes in form. The ventral portion of the vertebral body being usually chiefly affected, pus, when formed, usually passes forwards between the centrum and the anterior common ligament. Abscesses from high cervical disease usually present behind or to one side of the pharynx or œsophagus, or make their way into the posterior mediastinum. In dorsal disease the abscess may point behind directly over the lesion, or come forwards into the pleura or lung, or, more commonly, enter the sheath of the psoas muscle. Abscesses associated with lumbar disease pass into the loin, the iliac fossa, or the pelvis. In many cases the course of the abscess is aberrant, and perforation may occur into the œsophagus, trachea, intestine, and bladder. Sometimes there is a bilateral abscess cavity, usually communicating the one side with the other. The spinal cord is often compressed by collections of pus, or by tubercular granulation tissue, arising from the bone disease or from the spinal dura mater.

According to Trendelenburg, it is only in rare instances that compression is due to the bone impinging on the cord. On an average, compression of the cord occurs once in nine cases.

Clinical Course.—The disease often remains long latent. The first symptoms may be attributable to (*a*) The bone disease itself; (*b*) The involvement of the cord and nerve roots; (*c*) The development of an abscess; or (*d*) The effect of the disease on the general health. Pain is one of the most important and early symptoms. It is sometimes only complained of in one position, standing or lying down, and is often very severe and of a throbbing character. Sometimes it is spontaneous, but more frequently it is only complained of when pressure is brought to bear on the affected vertebræ by pressing on the head or shoulders (this manœuvre must be cautiously carried out), and is referred to the situation of the disease. Hot local applications and the galvanic current also bring out this symptom of local tenderness. Rigidity of the spine is a sign of importance, due to muscular contraction, or, in some instances, to anatomical bone changes, and best seen when the patient stoops and rises. This rigidity is often transitory, and may be mistaken for "rheumatism;" a transitory torticollis in a young subject should always make one suspect spondylitis. When situated in the upper cervical region the patient often supports his head with his hands. Any sudden movement is very painful.

Destruction of one or more vertebral bodies results in angular curvature; if the caries affects one side more than another, a lateral may be added to the antero-posterior deformity. Occasionally there is more than one such curvature. Swelling of the surrounding soft parts may make the deformity still more pronounced, and sometimes, in children, simulates a vertebral tumour, especially in the lumbar region.

General symptoms accompany the development of the bone disease: fever, profuse sweating, loss of flesh, etc.

Retropharyngeal abscess may interfere with respiration and deglutition. Psoas abscesses destroy the muscle and cause flexion of the corresponding thigh; later they appear in the iliac fossa, or the groin, more rarely in the back.

The nervous phenomena are: neuralgia, and hyper-

æsthesia, due to pressure on the nerve roots, or a plexus; and, in a later stage, paresis or paralysis below the lesion due to compression of the cord. Paraplegia of the lower limbs is usually associated with rigidity and with exaggeration of the tendon reflexes; the skin reflexes are retained or exaggerated. Girdle pain is often complained of; the functions of bladder and rectum are often affected. When cord conduction is completely abolished there is anæsthesia of the parts below as far up as the affected spinal segment; above the anæsthetic area there is often a hyperæsthetic zone. When the disease is situated in the lowest dorsal region the paralysis is flaccid, not spastic. When the lower cervical vertebræ are affected there will be atrophic paralysis of the arms, with spastic paresis of the legs. Paralysis in suboccipital disease will include bulbar symptoms.

Diagnosis and Differential Diagnosis.—In well-marked cases the diagnosis presents no difficulties, but in others these are considerable. A radiograph affords valuable assistance. Relatively often the disease is mistaken for vertebral tumour in its early stages. In the latter condition the pain is usually much more severe and more continuous; the deformity caused by tumour is not the acute angular curvature of spondylitis.

The traumatic spondylitis of Kümmel develops after a period varying from a month to a year after an injury to the spinal column; an angular deformity develops, with symptoms of compression of the cord and pain; but after some time recovery follows, or at least the condition becomes stationary.

INDICATIONS FOR OPERATION.

It must first be stated that there is no uniformity of opinion on the indications for surgical interference in this disease, but the majority, both of surgeons and physicians, recommend conservative methods, and only advise operation for the relief of paralysis, abscess, and other complications.

For the relief of paralysis there are only two procedures which need be discussed: laminectomy, and the forcible correction of angular curvatures.

Laminectomy is performed for the direct treatment of vertebral caries, particularly when paralysis is present.

Experience has shown that the actual bone disease cannot as a rule be removed; only the masses of tubercular granulation tissue can be dealt with, and intradural abscesses opened. Oppenheim has expressed his views on the subject as follows: "Laminectomy is called for in compression paralysis (*a*) In the exceptional cases of caries of the vertebral arch when conservative treatment has failed; (*b*) When, in opening an abscess, direct access is found to be obtainable to the affected vertebral body." Schede, Tillmanns, and Trendelenburg have also formulated indications for this operation. Schede considers laminectomy only a last resource, "when the condition of the patient is desperate" (Vulpius). Tillmanns advises it when palliative treatment has failed, in cases where high fever indicates the presence of pus, or where paralysis persists. Trendelenburg, in addition to these, recommends operation in old-standing cases in which an incomplete paralysis persists.

Calot's method, the forcible reduction of angular curvature, is hardly ever now employed in the form in which it was introduced; gradual reduction is practised by some surgeons, and appears particularly advisable in cases in which paralysis of a severe type is present.

When an abscess is retropharyngeal in position, and obstructs respiration, it should be opened; for abscesses in other situations, puncture, followed by iodoform and glycerin injection, is the best method (Henle, Vulpius).

Contra-indications.—In acute tubercular processes all operations are contra-indicated, except the treatment of abscess. No operation for curvature or paralysis should be undertaken unless palliative treatment has been given a long trial and been found ineffective, and no operation of any kind should be done when there is marked tuberculosis of other organs, advanced renal disease, an unsatisfactory general condition, or other like complication.

Prognosis.—*The results and risks of operation.*—The operative treatment of cases of spondylitis has given generally disappointing results, and the limits of indication have been correspondingly narrowed. Chipault's statistics of 103 cases of laminectomy showed only fifteen recoveries, and forty-three deaths soon after the operation. Cases of severe paralysis may improve or recover entirely after gradual correction of the deformity, or laminectomy, if the

bone disease is not of a very active type. Cold abscesses often subside or disappear after iodoform injection.

Without operation.—Complete rest, immobilization, extension, and the plaster jacket often bring about recovery. Many times I have seen paralysis of all four extremities recover under treatment with the plaster jacket. Oppenheim has recorded recovery to the extent of being able to walk, in a case of paraplegia of seven years' standing. About half the cases may be expected to recover with the use of orthopædic apparatus.

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OSTEOMYELITIS OF THE VERTEBRÆ.

Etiology.—Infection with staphylococcus aureus and albus, as in osteomyelitis of other bones. Trauma is a causative agent in a relatively large proportion of cases.

Pathological Anatomy.—The lumbar vertebræ, and next, the dorsal vertebræ, are the most frequently affected. Sometimes one, sometimes several vertebræ are attacked, and either the centrum, or the arch, or spinous process may be involved. The sequestrum may be of such a size that an angular curvature is formed. Pus may compress the cord, or point under the skin of the back, or behind the pharynx. Sometimes a psoas abscess is formed.

Clinical Course. This rare affection usually begins acutely with symptoms of general constitutional disturbance, high fever, and frequently rigors. Sometimes, but rarely, the onset is more gradual. Tenderness of the affected vertebræ, with rigidity, appears early. At the end of the first week there is marked inflammatory swelling of the tissues of the back, at the site of the disease, going on to abscess formation. If the vertebral bodies are affected, a retropharyngeal abscess forms if the disease is cervical;

but if it is situated lower, an abscess forms which may burst into the pleura, and is hardly recognizable clinically.

Diagnosis.—The diagnosis may sometimes be made when severe constitutional symptoms are present, with localized tenderness over the spine, inflammatory œdema, and abscess. The disease is more easily recognized when it affects the laminæ and spines, than when the centra are involved.

INDICATIONS FOR OPERATION.

Operation should be undertaken immediately the diagnosis has been made. Pus is evacuated, and, when possible, the diseased bone is removed.

Risks of operation.—These are greatest when operation has been delayed ; the condition of the patient will be then more unsatisfactory and the operation more extensive.

Prognosis.—*If no operation is performed* death will probably take place, the total mortality of all cases, including those successfully operated on, being over 60 per cent. At the best, a prolonged illness, with probably amyloid disease, is to be expected.

Results of operation.—In most cases the disease has been cut short by operation, with recovery ; sacral osteomyelitis has, however, up to the present, given bad results.

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TRAUMATIC AFFECTIONS OF THE SPINAL CORD.

Etiology.—Traumatic affections of the spinal cord result from direct or indirect violence to the spinal column ; actual lesions of the latter may or may not be present in association.

Pathological Anatomy.—Trauma may give rise to severe and extensive destruction of the spinal cord, especially of its central parts, by necrosis and hæmorrhage, without any discoverable lesion of the spinal column, such as fracture or dislocation, or of the meninges. On the other hand the cord may be markedly compressed by a detached bone splinter or a dislocated vertebra without any notable change in its structure, even when the lesion has existed for several months. Speaking generally, however, injuries of

the spinal column are usually complicated by lesions of the cord. In 100 cases collected by Wagner and Stolper, the cord was involved in seventy-one, unaffected in twenty-nine. It is often completely pulped at the point of greatest compression. Epidural hæmorrhages are common and often very extensive, but do not as a rule cause compression of the cord. The nerve roots are very rarely destroyed, compressed, or damaged by bone splinters. They are usually compressed along with the cord when the latter is pulped, either at their attachment or in their course through the intervertebral foramina. Occasionally, but rarely, the cord is compressed by callus thrown out after fracture or by connective tissue formed at the site of meningeal lesions.

Clinical Signs.—These may be divided into two groups ; the first comprising those which are due to anatomical changes in the spinal column, the second those which belong to the nervous system. Luxation may be complete or incomplete, unilateral or of both intervertebral joints. As a rule deformity can be made out by palpation or by X-ray examination ; it may show itself as a displacement forwards of a spinous process, and in the neck a prominence may be felt on palpation of the pharyngeal wall. In unilateral dislocations the spine is rotated with the convexity on the side of the displacement. Dislocations are most common in the cervical and rarest in the lumbar regions.

Fracture gives rise to very similar deformities. Occasionally detached bony fragments can be palpated. Radiography is of great value. In one of my own cases a radiograph showed a bony lesion unrevealed by any other sign, the case being apparently a pure cord lesion. Fracture is most common in the lower dorsal and upper lumbar regions. The combination of total luxation with fracture is comparatively common, especially in the lower dorsal segment.

In some cases of fracture-dislocation the cord escapes. When it is involved, the symptoms may indicate a complete or an incomplete interruption of conduction. Complete interruption, whether due to pulping, hæmorrhage, necrosis, laceration, or compression, is characterized by the following signs :—

1. Loss of cutaneous sensibility in the areas whose sensory nerves reach the cord below or at the level of the cord lesion. The area of anæsthesia does not, however, extend as far upwards as the vertebra concerned; its upper level is usually below this, even when one takes into account the fact that the spinous process which projects backwards does not usually belong to the vertebra which is causing the compression. This difference in level between the bone lesion and the area of anæsthesia is due to the oblique course which the spinal nerves pursue in the spinal canal, and to the fact that they usually escape injury at the site of the fracture-dislocation. The nearer the latter is to the point where the cord ends, the more marked is the difference between the levels of the lesion and the anæsthesia.

2. Flaccid paralysis of the muscles whose motor nerves leave the cord below or on a level with the lesion. Only the muscles innervated from the spinal segment or segments destroyed undergo atrophy.

3. The motor and sensory paralysis is congruent and symmetrical.

4. The patellar reflexes are at once lost and remain absent.

5. Interference with the functions of the bladder and rectum is the rule; renal affections are common.

6. Vasomotor paralysis is present and coterminous with the motor and sensory paralysis. Wagner and Stolper emphasize three signs as being diagnostic of a total transverse lesion of the cord. (*a*) The congruence and symmetry of motor and sensory paralysis. (*b*) The absence of any signs of irritability in the paralyzed area. (*c*) The loss of the patellar reflexes.

The same authors look upon the following as indicative of a partial cord lesion :—

1. When the motor paralysis and the sensory paralysis do not coincide in extent.

2. When the paralysis is not symmetrical.

3. When there are signs of irritation, either motor or sensory, in the paralyzed area.

4. Retention of the patellar reflexes; these are rarely abolished in incomplete lesions, are usually exaggerated, often differ on the two sides, and never remain permanently absent.

5. When the paralysis lessens in degree, or sets in late, or is incomplete in both motor and sensory spheres.

6. When function is either completely or partly restored in the first or second week.

Compression of posterior roots is shown by the presence of radiating pains, and by hyperæsthetic or anæsthetic spots in the corresponding skin areas. Phenomena of motor irritation (twitching, spasm) or of atrophic paresis in the muscles point to compression of anterior roots through which the muscles concerned derive their nerve supply. When the vertebral lesion is below the second lumbar level the cauda equina alone will be involved. Lesions of the latter can hardly be differentiated from lesions of the conus terminalis. In cauda lesions, however, phenomena of sensory irritation are relatively common, and the paralyses are often unsymmetrical and incomplete, while in conus lesions there is symmetry, and complete paralysis is more frequent.

Differential Diagnosis.—There may be some difficulty in differentiating these lesions from spinal concussion without vertebral injury; indeed, according to Kocher, there is always some traumatic necrosis or hæmatomyelia in concussion. Rapid retrogression of symptoms will show that there is no necessity for operation. Traumatic spondylitis (Kümmel), which appears some time subsequently to trauma, with pain, rigidity, and signs of compression of the cord, is always associated with the development of an angular curvature, and spontaneous recovery occurs when the patient is kept at rest.

Latent and stationary Pott's disease may be aggravated by trauma with the development of symptoms pointing to compression of the cord, and the same is true of cases of vertebral neoplasm. A benign tumour in the spinal canal can hardly be distinguished from exuberant vertebral callus. A malignant tumour progresses rapidly and gives rise to persistent agonizing pain, while the pain associated with vertebral injuries gradually lessens in intensity. There can rarely be any confusion with vertebral tuberculosis. Crushing of the intervertebral disc is to be recognized, according to Kocher, by local pain on pressure on the head or shoulders, and tenderness, swelling, and prominence over the spines immediately above.

INDICATIONS FOR OPERATION.

At present there is no agreement as to the indications for surgical intervention in cases of fractured spine. It is agreed, however, that laminectomy is advisable in cases of some standing, when the symptoms are those of incomplete interruption of cord conduction. Quite recent cases should not be operated on, for the early symptoms may clear up spontaneously to a very great extent*.

Too long delay may, however, result in irreparable damage to the cord. Most writers advise operation when symptoms persist, not earlier than the fifth week, and not later than the third month after the accident. Early operation is, on the other hand, to be recommended when there is a comminuted fracture of the vertebral arches, with depression and probable damage to the cord ; also in irreducible fracture-dislocations in the region of the cauda equina, and in cord lesions produced by firearms and sharp instruments.

In fractures which do not belong to one or other of these types, few surgeons at the present time advise early operation, though at one time it had many advocates (Wagner, Chipault, Lejars, Biddle, Hammond, and others).

In cases of persistent paralysis, when there is a deformity pointing to fracture of the vertebral arch, laminectomy is indicated. It is also recommended by many authors, even when there is no obvious deformity, in cases in which the paralysis is not old-established, when compression seems probable, and cord conduction is not completely interrupted.

If paralysis come on some weeks or months after the fracture, and appear to be due to cord compression, an exploratory laminectomy should be done with the idea of dealing with exuberant callus, or adhesions between the meninges and the more or less displaced vertebra.

In luxations, reposition should be done as far as possible. Laminectomy should, according to Chipault, be done only in old-standing luxation with slight symptoms. Kirmisson,

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* In one of my cases a fall from a great height was followed by motor and sensory paralysis of the lower limbs. Examination pointed to a probable fracture of the first lumbar vertebra. The paralysis gradually disappeared spontaneously and had gone completely at the end of about a year.

however, advises it when the attempts at reposition have proved unsuccessful, but the symptoms must be of a certain degree of severity to justify the operation.

Contra-indications.—When the symptoms point to complete local destruction of the cord, no operation should be done. Persistent complete loss of cord conduction is, therefore, a contra-indication. From what has been said already it will be gathered that I consider no operation is called for in recent cases, nor in cases of some years' standing in which the paralysis is stationary.

PROGNOSIS.—*If operation be undertaken.*—Hahn has collected sixty-four cases of laminectomy for vertebral fracture, recorded between the years 1893 and 1897. In 30 per cent recovery or improvement resulted; in 19 per cent the improvement was insignificant; in 12 per cent there was no change; and in 39 per cent death occurred. The results were most unfavourable (66 per cent fatalities) in cervical and high dorsal fractures, and most successful in lumbar fractures. There is no doubt that in a not inconsiderable number of cases operation has been harmful; it should, therefore, only be recommended when the indications are clear. On the other hand, one must not lose sight of the fact that in a certain number of cases complete success has been attained, cases which, left to themselves, would have remained paraplegic all their lives, and died at an earlier age.

When no operation is undertaken in suitable cases, the patient is condemned to a condition of permanent marasmus, and to the risks of life which arise from cystopyelitis, pressure-sores, and other complications. Operation also may be delayed too long to stay the progress of degeneration processes in the spinal cord.

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TUMOURS OF THE SPINAL CORD.

Pathological Anatomy.—The term "tumours of the spinal cord" is intended to include both tumours originating in the cord, and those which originate outside the cord and compress it. Only the latter are suitable for operation; they may be either intradural or extradural. Of the intravertebral growths the intradural are about as frequent as the extradural; tumours of the vertebræ encroaching on the cord are twice as common as all other meningeal and medullary tumours together. Most common are the extramedullary tumours of the dorsal region. Metastatic growths, both carcinomata and sarcomata, are almost always extramedullary. Meningeal growths are usually primary, and more often malignant than benign; tumours of the vertebræ are almost always malignant. The meningeal tumours very rarely infiltrate the cord; usually they simply compress the latter from outside. The most common extramedullary tumours (sarcoma, psammoma, endothelioma, hydatid, fibroma, etc.) are well defined. Some types (sarcoma, neurofibroma, gumma, hydatid), may be multiple or diffuse; diffuse sarcomatosis is usually associated with growth in the cerebellum. Multiple tumours are much less common than single growths. Trauma appears to favour the development of spinal tumours.

Clinical Course.—In many cases the clinical phenomena make their appearance in a definite order. The first signs are those of irritation of the nerve roots; then follow those of compression of the cord, at first on the same side as the root irritation phenomena, and later bilateral. Lastly (but sometimes early) localized pains appear, and sometimes vertebral deformity.

Irritation of the nerve roots is shown chiefly by intense neuralgic pains, usually unilateral, sometimes bilateral; the pains being associated with hyperæsthesia. If the tumour is situated on an anterior root in the cervical or

lumbar enlargements, there are motor disturbances, soon followed by muscular atrophy.

As the condition progresses hyperæsthesia may be replaced by anæsthesia, or the most prominent change may be an extension of the area of hyperæsthesia or anæsthesia. The vertebral column may show rigidity. Usually the root symptoms are rapidly followed by those of cord compression. These take the form of spastic paresis of the extremities, often at first on one side, and later on both. Tumours low down will affect only the lower limb, cervical tumours will affect both upper and lower. At this stage the symptoms resemble transitorily those of Brown-Séquard's paralysis. When complete paraplegia develops, the bladder and rectum functions are disturbed, or this may occur at an earlier stage. The intense neuralgic pains persist along with the signs of cord compression.

The symptoms vary very much according to the site of the tumour, and no detailed description can be given here. The exact position of tumours near the caudal end of the cord may be very difficult to diagnose. When the symptoms point to the involvement of nerve roots or cord segments at different levels, the case is probably one of multiple tumour. In one of my cases a tumour was diagnosed about the centre of the dorsal spine, and operation was advised; later, symptoms referable to the lumbar spine appeared, multiple tumour was diagnosed, and no further operation was recommended. The autopsy showed multiple neurofibromata.

Diagnosis.—One must seek to establish not only the presence, but also the exact position of a tumour. The position, or rather its upper limit, can usually be accurately determined by observing the phenomena of irritation and paralysis caused by lesion to the nerve roots and cord. Neurological works should be consulted for further information on localization.

Differential diagnosis.—Tumour may most easily be confused with vertebral caries; in the latter the curvature is angular and acute, not arched; the presence of abscess and of tuberculosis in other organs, the tendency to spontaneous recovery, and the absence of persistent nerve root symptoms point to caries. The presence of a primary growth elsewhere, of spontaneous fractures of long bones, pain without

tenderness over the spine, and the appearance of herpes zoster, are in favour of tumour.

Syphilis must be considered, and will be indicated by the presence of other lesions elsewhere, and by improvement under antisyphilitic treatment.

With regard to whether a growth is within the canal, or growing from the bone, it should be noted that metastatic growths almost always arise in the bone; and hydatids are, with few exceptions, within the canal. Osseous growths usually cause greater local destruction than tumours of the canal; deviation of the spinous processes points to a bone tumour. An exact diagnosis between vertebral and intravertebral, and between extra- and intramedullary tumours cannot be made with certainty.

INDICATIONS FOR OPERATION.

When the symptoms point to the presence of a single, primary, intravertebral, and extramedullary tumour, and enable one to make an exact diagnosis of the level at which it is situated, then an operation for its removal should be undertaken. Operation should only be recommended for a metastatic growth when the primary tumour has been removed, and when there is reason to believe that no other metastases exist.

Contra-indications.—The operation must be looked upon as a serious one, and should, therefore, not be undertaken unless the general condition is good. When there is reason to believe that the tumour is intramedullary, no operation should be done, in particular when there is bilateral partial anæsthesia of long standing with extensive and rapidly progressive muscular atrophy, paresis of both legs, and marked involvement of the upper limbs. Operation is, likewise, contra-indicated for metastatic vertebral tumours and multiple tumours, and should never be undertaken in any case until antisyphilitic treatment has been tried.

The dangers of the operation are still great; about a half of the cases have died, either immediately or some days after intervention.

Prognosis.—*Of operation.*—When a growth is successfully removed recovery may follow, providing no irreparable damage has been done to the cord. Up to the present, however, the number of successful cases is small.

The results of an error in diagnosis may be disastrous; for the opening of the vertebral canal is always dangerous, owing to the risks of hæmorrhage and infection.

Prognosis without operation.—Tumour of the spine is necessarily fatal when left alone, but death may be long postponed. My own statistics show, in sixty-three cases of intradural growths, an average duration of life of 25·6 months from the appearance of the first symptoms up to death; in forty-six extradural cases the average was 13·6 months. In these statistics I have not included the very prolonged cases, sometimes surviving ten years. If these were included the figure for extradural cases would rise to 17·2 months. In one of my cases death did not occur until four years after the time when operation was recommended; the autopsy showed that it would have been useless.

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ACUTE POLIOMYELITIS.

Etiology.—Poliomyelitis is probably the result of an infection. Trauma, perhaps, plays a part in its etiology, but there is at present no real proof of this.

Pathological Anatomy.—Poliomyelitis is an acute inflammatory condition of the anterior horns of the grey matter of the cord. The meninges and the grey matter of the medulla oblongata may participate in the process.

Clinical Course.—The disease begins acutely; the initial symptoms being those of a general febrile disorder. After some hours, or days, paralysis appears, and at once attains to the maximum of its extent. In the great majority

of cases this paralysis affects one or both of the lower limbs ; more rarely the arms or the four extremities. In the course of a week, or a month, the extent of the paralysis often diminishes ; according to Remak this improvement may take place even after the lapse of a year. Increase of the paralysis by successive aggravations is very rare. The paralysis is flaccid and degenerative, and after the early improvement has passed, it persists in several muscles, or muscle groups. Certain muscles, the sartorius for example, are very rarely paralyzed, while others are involved in a large number of cases. In the upper limb the deltoid and other shoulder muscles are exceptionally often affected. If faradic excitability is not lost in a paralyzed muscle, functional power will return to it. Vasomotor paralysis in the paralyzed limbs is shown by the bluish-red colour of the skin. The sensory functions, and those of the bladder and rectum, are undisturbed. As time goes on it is noticed that the paralyzed limb is shorter than its fellow, and the bones themselves are atrophied. In a few instances lengthening has been recorded. Deformities are produced by contracture of the antagonistic muscle groups. For example, if the tibialis anticus is paralyzed, and the peroneal muscles unaffected, pes valgus develops. In an analogous way pes varus, planus, or calcaneus may be produced. Pes equino-varus occurs when the extensor muscles are generally affected, with the exception of the tibialis anticus; pes planus when the peronei and the flexors of the sole are paralyzed; and pes equinus in paralysis of the calf muscles. Contracture of the flexors of the knee is comparatively frequent. Well-marked contractures of the upper limb muscles are, on the other hand, very uncommon. When the muscles which control a joint are paralyzed the joint becomes flail ; this is especially common in the shoulder and hip, and may be followed by spontaneous luxation.

Differential diagnosis.—When the affection has been present for some weeks a mistake in diagnosis can hardly occur. Multiple neuritis progressively increases in severity from its commencement for several weeks; acute poliomyelitis reaches its maximum in the first few days. In multiple neuritis the fever lasts longer ; there is pain and tenderness on pressure in the nerves and muscles, and there are disturbances of sensation, which are almost

entirely absent in poliomyelitis. The appearance of œdema and the participation of the cranial nerves point to multiple neuritis (Oppenheim).

Injuries to the spinal cord may cause symptoms resembling those of poliomyelitis, but the history will make the diagnosis clear. Syringomyelia develops slowly and progressively, and evokes certain sensory disturbances. Obstetric paralysis involves the upper limbs only in the areas supplied by the fifth and sixth cervical nerves.

INDICATIONS FOR OPERATION.

Only the effects of the disease can be dealt with by surgical measures. These measures may be divided into three groups. (1) Those undertaken to relieve the paralyses of some parts of the limbs ; (2) Those by which contractures are overcome to render possible the wearing of some orthopædic apparatus ; (3) The fixation of useless articulations. For the relief of paralyses the grafting of tendons of intact muscles on to those of paralyzed muscles is employed. This method is suitable for cases of partial paralysis of more than a year's standing when healthy vigorous muscles are available adjoining the paralyzed muscles.

When deformity has been produced by contractures, tenotomy is to be employed to mobilize the affected joints, in particular with a view to the further employment of orthopædic apparatus.

The fixation of a joint (arthrodesis) is indicated (1) In total paralysis of all the muscles controlling the joint. (2) Where without total paralysis the joint is nevertheless flail. (3) In complete functional uselessness of a joint owing to secondary contractures. By arthrodesis the necessity for the wearing of special orthopædic apparatus is avoided, and it is, therefore, of value when the cost of such apparatus cannot be borne, or the time necessary for carrying out orthopædic treatment is not available.

In writing of the value of arthrodesis for poliomyelitic paralysis at the shoulder, Vulpius recommends that it should be practised only when there is no prospect of further spontaneous improvement, that is to say, when the paralysis has been present for over a year, and only when the hand is unaffected ; its usefulness is somewhat prejudiced by

paralysis of the upper arm muscles, yet it may be properly recommended under such circumstances.

Results of operation.—Tendon transplantation often restores the function of a limb to a notable degree; the results reported by Vulpius illustrate this in a remarkable manner. The fixation of joints often greatly increases the usefulness of a limb, and facilitates the application of further orthopædic treatment.

The risks of operation are inconsiderable.

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CHAPTER III.

Diseases of the Peripheral Nerves.

Chapter III.

DISEASES OF THE PERIPHERAL NERVES.

NEURALGIA OF THE FIFTH CRANIAL NERVE (*Tic Douloureux*).

Etiology.—Trigeminal neuralgia may be due to a variety of causes. It may be associated with one of the infective diseases, such as malaria and influenza, or follow chill or trauma. It may be set up by disease in some neighbouring structure, bone, meninges, vessels, or be due to caries of the teeth, anæmia, affections of the digestive tract, or disorders of the female genital organs.

Clinical Course.—The affection is characterized by attacks of intense pain, often apparently brought on by some slight extraneous cause, or occurring spontaneously.

The attack is often accompanied by watering of the eyes, by profuse discharge from the nose, or by excessive salivation, according as the neuralgia particularly affects the first, second, or third branches of the nerve. The skin of the face and the conjunctiva are usually injected, and a herpetic eruption sometimes appears on the nose or the face. Pressure on the points of exit of the branches is often very painful. Occasionally, but very rarely, there is partial anæsthesia of the area supplied by the nerve. The pain radiates from the branch first affected to others, and sometimes to the occipital and cervical nerves.

Diagnosis and Differential Diagnosis.—The diagnosis is based on the clinical symptoms already noted. The condition must be differentiated from frontal and maxillary sinusitis, which usually follow influenza, are characterized by purulent secretion from the nose, and may be demonstrated by transillumination. It may be distinguished from frontal periostitis, particularly the syphilitic form,

by the local signs revealed by palpation, and by the results of antisyphilitic treatment. Dental neuralgia will be indicated by the presence of carious teeth tender to pressure. Glaucoma is differentiated from neuralgia of the ciliary branches by the increase of ocular tension, restriction of the visual field, and by the appearances seen with the ophthalmoscope. In migraine there is intense pain, but, in addition, photophobia, auditory hyperæsthesia, a tendency to vomiting, and relatively severe general disturbance. Cephalalgia is usually bilateral, and is different in localization from trigeminal neuralgia. In rheumatism of the scalp the latter is diffusely tender to pressure. When trigeminal neuralgia is due to some central cause there will be present other symptoms referable to involvement of other cranial nerves.

INDICATIONS FOR OPERATION.

Operation is only called for when the diagnosis of severe peripheral trigeminal neuralgia is clearly established, and when the various internal and external remedies which are recommended for the condition have proved ineffectual. It is to be looked upon as a last resource when the pain is unbearable and other means have failed. If the neuralgia is confined to one branch, one of the procedures of lesser severity should be employed. If these fail, and only after they have been tried, should removal of the Gasserian ganglion, or section of the nerve behind the ganglion, be undertaken.

Contra-indications.—In bilateral neuralgia operation will probably be unsuccessful (Friedrich), and is not to be recommended. If after careful resection of a portion of a nerve, symptoms return in the corresponding area of innervation, either immediately or after a short period, then a further operation will probably be attended with little success. When it appears probable that the neuralgia is due to some central lesion no operation on the nerve is justifiable.

Prognosis.—*Of operation.*—Of Thiersch's cases, kept under observation for six years, more than a third remained entirely free from recurrence, while in about a third there was a definite return of symptoms. These were all cases of severe trigeminal neuralgia of several years' standing,

and were treated by nerve resection. Extirpation of the Gasserian ganglion appears to afford permanent relief; there was no return of symptoms in any of Krause's cases.

Risks of operation.—Krause's operation is attended with definite risk. In about 15 per cent (17 out of 113 cases) death has followed the operation. It is remarkable that neuroparalytic keratitis, or other serious complication, has rarely occurred.

Nerve resection is, of course, a much less serious operation, and, unless complications occur, is unattended by risk to life.

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OCCIPITAL NEURALGIA.

CLINICAL SIGNS.—Occipital neuralgia is a term used to indicate neuralgia of the sensory branches of the cervical plexus. Usually the pain extends from the neck to the vertex in the distribution of the great occipital. More rarely it is situated laterally in the distribution of the small occipital and great auricular. The pain is paroxysmal, and more frequently complained of in the evening than the morning. During the attack the head is kept rigid and the occiput supported with the hand, the skin over the occiput being often tender to pressure. Three tender points may be demonstrated: the occipital point between the mastoid process and the atlas, the parietal point in the neighbourhood of the parietal eminence, and the cervical point between the anterior border of the trapezius and the posterior border of the sternomastoid.

ETIOLOGY. — Most frequently this affection follows exposure to cold or trauma, or in the course of some infectious disease, or some intoxication. Hysteria and neurasthenia may also influence its onset. Frequently it arises in connection with disease of the vertebræ or the meninges

(tuberculosis, carcinoma, syphilis, arthritis deformans). Sometimes it is due to tumour of the brain or other central lesion.

Diagnosis and Differential Diagnosis.—In diagnosis special attention should be paid to the tender points and to the absence of other phenomena. The posterior pharyngeal wall will be examined for signs of vertebral disease. In rheumatism of the neck muscles the affected muscles are tender to pressure. Hysterical pain in the neck is influenced by suggestion, and usually extends to the back; the tender spots do not correspond to the points of emergence of the great occipital. In cervical Pott's disease there are spinal symptoms, persistent rigidity of the vertebral column, and swelling of the overlying soft parts.

INDICATIONS FOR OPERATION.

Operation may be advised when all medical remedies have proved ineffectual. This will consist of division of the nerve near its proximal end, and exeresis of the peripheral branches by the method of Thiersch. If intense pain persists in spite of this, the more serious operation of division of the posterior roots of the upper cervical nerves in the spinal canal is indicated (Chipault), but this should at present be reserved for what may be called the desperate cases.

Prognosis.—*Risks of operation.*—The risk of cutting or injuring the phrenic nerve is small if Krause's procedure be followed. The division of the posterior roots is a distinctly dangerous operation.

Contra-indications to operation.—If some disease of the vertebræ is present, if there is some central lesion, or if the neuralgia is due to functional causes, no operation should be done on the nerves or roots.

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BRACHIAL NEURALGIA.

Etiology.—According to Oppenheim some neuropathic predisposition is usually present in cases of brachial neuralgia. The infective disorders, anæmic and cachectic states, diabetes, and gout also predispose to the affection.

Many cases are due to trauma, such as wounds or fractures of the upper arm and clavicle ; others are due to affections of the subclavian artery or aorta, or to the presence of a cervical rib.

Pathological Anatomy.—Brachial neuralgia may be caused by gross anatomical lesions in the neighbourhood of the nerves, but under such circumstances neuritis, more commonly than neuralgia, results. Such gross lesions may be the result of the pressure of a cervical rib (especially if affected with periostitis), the pressure of callus or scar tissue, of a bone splinter, or a foreign body. In torticollis the contractured neck muscles may exert direct pressure on the nerves of the brachial plexus.

Clinical Signs.—Generally, in brachial neuralgia, the distribution of the pain is not sharply defined, but it may chiefly affect the distribution of a single nerve. The pain is sometimes continuous, more frequently paroxysmal, and easily set up by movements of the arm. Painful spots are found at the point where the radial nerve passes to the dorsum, over the ulnar nerve by the side of the olecranon, over the median in the fold of the elbow, over the joints of the hand, and over the plexus itself, to the side of the lowest cervical vertebræ. Trophic disturbances develop only when neuritis is present.

Diagnosis and Differential Diagnosis.—In many affections of the central nervous system pain may be present in the distribution of the brachial plexus, for example in tabes, syringomyelia, tumour of the cord, pachymeningitis, and spondylitis ; but these are differentiated by the presence of other characteristic symptoms, and the same is true of diseases of the large vessels. The diagnosis is only arrived at after excluding diseases of the bones, joints, and muscles.

INDICATIONS FOR OPERATION.

The indications may be divided into two classes. If the signs point to compression of nerves by callus or other means,

or to complete or partial severance of nerves, these lesions should be dealt with by operation as soon as possible. Cervical ribs should be removed, if no other cause for the neuralgia is to be found ; in two such cases under my care, removal of the rib was followed by complete disappearance of the pain. If torticollis is complicated by constant bronchial neuralgia, the sternomastoid should be divided.

When no gross anatomical lesion can be discovered to account for the neuralgia, operation, that is to say, stretching of the nerve, either after open operation or by the bloodless method of Naegeli, should only be practised when all other methods of treatment have failed.

Contra-indications.—No proposal to operate will be entertained if the neuralgia is caused by some inaccessible anatomical lesion.

All symptomatic neuralgias, such as those secondary to diseases of the spinal cord and vertebræ (except tumours of the nerve roots and meninges), or to affections of the large vessels, are also unsuitable for operation.

When no operation is undertaken the lesion which is setting up the neuralgia will, in many cases, give rise to destructive anatomical changes in the nerve, and the resulting damage may be irreparable.

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INTERCOSTAL NEURALGIA.

Etiology.—Intercostal neuralgia is especially common in anæmic individuals, in pulmonary tuberculosis, and after influenza. Among other etiological factors must be mentioned hysteria, debility after fevers and during lactation, and some affections of the circulatory system.

Clinical Signs.—The pain is usually in the distribution of the anterior branches of several of the intercostal nerves; it is sometimes very intense and increased by movements, such as coughing and sneezing. There are usually three tender spots; one close to the vertebra—the vertebral point; one in the axillary line—the lateral point; and one near the middle line in front. The skin of the affected area is usually hyperæsthetic. The affection is more common on the left than on the right side of the body.

Diagnosis and Differential Diagnosis.—Intercostal neuralgia is very often a symptom of disease elsewhere. It may be produced by disease (tuberculosis or tumour) of the vertebræ, of the meninges (meningitis, tumour), or of a spinous process. It is frequently a symptom of the neuritis of herpes zoster; it may also be associated with injuries to the ribs, or with aortic aneurysm. Such conditions will be recognized by other characteristic signs. The presence of anæsthesia is against a simple neuralgia, as is also the presence of vertebral deformities, severe cord symptoms, or of abnormalities of the ribs. The diagnosis will be based on the clinical signs already related.

INDICATIONS FOR OPERATION.

Most intercostal neuralgias improve spontaneously, or after internal medication, so that only the subacute and chronic forms are suitable for operation if, after other methods of treatment have been tried, the pain still persists in an intense form, and is not merely symptomatic of disease elsewhere. Operation will take the form either of stretching, resection of the nerve, or division of the posterior root within the dura mater.

Contra-indications.—Operation will not be undertaken when lesions, such as aneurysm, spinal disease, etc., are present. According to our present knowledge of herpes zoster, operation is not justifiable for the associated neuralgia.

Prognosis.—*Risks of operation.*—The resection of one or more nerves is not attended by any risk, but the results have been favourable only in a certain number of cases. Nerve stretching may also fail to relieve. Division of the posterior roots is an operation dangerous to life, and recovery from the neuralgia cannot be guaranteed.

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MERALGIA PARÆSTHETICA (Roth-Bernhardt).

(*Neuralgia of the Nervus Cutaneus Femoris Externus.*)

Etiology.—This affection often develops after exposure to cold, injury, acquired syphilis, infectious diseases, gout, and pregnancy. It occurs with especial frequency in alcoholics, more rarely in affections of the central nervous system.

Pathological Anatomy. — Often some anatomical peculiarity can be demonstrated causing pressure on the nerve, and in particular pressure by the iliofemoral band, with which the nerve is in close association for a considerable part of its course. In one case pressure by the sharp edge of the iliopectineal ligament was found to be the cause of the pain. Examination of resected portions of the nerve has demonstrated various anatomical changes (neuritis, etc.).

Clinical Signs.—The characteristic of this condition is the presence of defined areas of sensory disturbance, subjective and objective, over the outer side of the thigh below the trochanter, all the sensory functions being equally affected. Occasionally the front of the thigh is affected. The pains are usually worse when the patient is standing, and relieved when he lies down ; they are often bilateral. The symptoms may persist for many years.

INDICATIONS FOR OPERATION.

Operation is only indicated when other treatment, local and general, has failed, and when the affection is present in an acute form. Such operation will consist of stretching or resection of the nerve, or freeing of the ligament which is compressing the nerve. Operation should be recommended early, if the patient is prevented from following his usual occupation. When some central lesion is

associated with the symptoms of meralgia, no operation should be done on the nerve.

Results.—When the nerve is resected there will remain anæsthesia over the area of its distribution. As a rule, operation relieves the symptoms entirely; if there be any return it is usually of a mild type.

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SCIATICA.

ETIOLOGY.—Exposure to cold, or injury, is frequently concerned in the etiology of sciatica; also gout, diabetes mellitus, and certain intoxications—alcohol, lead. It may also be set up by venous engorgement in the pelvis, compression by tumours, by the gravid uterus, or by fæcal masses, and by certain infective disorders—gonorrhœa, syphilis, enteric fever, influenza, etc.

ANATOMICAL CHANGES.—The nerve is in many cases fixed to surrounding parts by adhesions, in others compressed by changes in neighbouring organs. Pure sciatic neuralgia is not accompanied by inflammatory changes in the nerve.

CLINICAL SIGNS.—By sciatica is meant a neuralgia of the great sciatic nerve and its branches. Pain is usually complained of along the whole length of the nerve from the buttock to the toes, is increased by pressure, and by movement, and comes and goes in attacks of considerable violence. There is frequently some scoliosis, with the concavity of the curve on the affected side. There are, as a rule, tender spots along the nerve, for example between the trochanter and the tuber ischii. Acute pain is caused if the thigh is flexed with the knee extended. There is no motor paralysis, and, as a rule, no objective sensory

disturbance. Occasionally cold spots may be demonstrated on the skin of the leg.

Diagnosis and Differential Diagnosis.—The clinical signs just mentioned will make the diagnosis clear. Marked sensory disturbances co-existing with degenerative atrophy point to neuritis. Many affections give rise to pain in the area of the great sciatic, and simulate true sciatica. In lumbago, the tender spots along the nerve are absent; in affections of the cord, and in tubercular and carcinomatous spondylitis, there are various spinal symptoms which are absent in true sciatica: weakness of the legs, changes in the tendon reflexes, disturbances of the bladder and rectum. Certain vascular affections, arteriosclerosis and endarteritis obliterans, may cause pain in the legs, but are usually associated with alterations in the pulse of the arteries of the foot. Rectal and vaginal examination will enable one to exclude the possibility of pelvic new growths involving the sciatic nerve. In disease of the hip joint all movement at the joint is painful, whether the knee is extended or not.

INDICATIONS FOR OPERATION.

When internal treatment has failed and the pain is severe, stretching the nerve should be undertaken, first by the bloodless method; and then, if this be unsuccessful, by open operation. If sciatica follows a definite trauma, then operation should be advised earlier (stretching of the nerve after exposure by incision), but not infrequently the symptoms are unrelieved thereby. In one case under my own observation there was no improvement until two years after stretching.

Contra-indications.—Sciatic pains caused by inoperable tumours of the pelvis or spinal column, or secondary to some spinal disease, are not suitable for operation. No operation should be done when the symptoms are due to some disorder of nutrition.

Risks of the operation.—Bloodless stretching appears to be free from risk. After the open operation, motor and sensory paralysis, both temporary and persisting, have been observed in a few cases. I have seen a case of paralysis persisting five years after operation.

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FACIAL SPASM.

ETIOLOGY.—Among the causes of facial spasm are: affections in the distribution of the fifth nerve (teeth, cornea, conjunctiva, etc.), direct irritation of the seventh nerve by tumour, aneurysm, or other mechanical cause, psychical disturbances in hysterical and neurasthenic individuals.

CLINICAL SIGNS.—The spasm is more frequently clonic than tonic; it is sometimes confined to one or two muscles, but usually affects the whole of one side of the face. Generally it occurs in paroxysms, and is provoked by mastication, speaking, emotional disturbance, or exposure to cold. In some cases, particularly in blepharospasm, there are tender spots to be found at the points of emergence of the trigeminal, especially the supra-orbital branch, and pressure on these points may temporarily check the muscular spasm. The affection is usually chronic, and persists for many years.

INDICATIONS FOR OPERATION.

Even in inveterate cases, which have resisted other methods of treatment, operation should only be undertaken after it has been explained to the patient that success is exceptional, and when he still persists in his desire that an attempt should be made to relieve him by these means. There cannot, therefore, be said to be any absolute indication for the operation. When the spasm is arrested by compression of the supra-orbital nerve, resection of the latter (not simple division) should be done, and has given relief in many cases. When the spasm is not checked by pressure on any such point, and when the patient persists in his demand for, at any rate, a temporary relief, even at the risk of paralysis, the nerve may be stretched after exposure by incision. When function returns to the facial muscles, the spasm may also return. If this operation

is unsuccessful the application of the actual cautery to the neck may be tried, but the indications for this are no more definite than those for other operative measures in this affection.

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SPASM OF CERVICAL MUSCLES (Spasmodic Torticollis).

Etiology.—This affection is most frequently found in individuals of neuropathic tendencies. It may be set up by traumata, intoxications, and organic lesions of the brain and spine.

Clinical Signs.—The spasm may be clonic or tonic, unilateral or bilateral. Sometimes only one muscle is affected, sometimes a whole muscle group, and sometimes the whole of the muscles of the neck. The sternomastoid and trapezius muscles are involved with special frequency; sometimes the affected muscles show hypertrophy. The intensity of the attacks is increased by emotional disturbances; for example, if the patient sees that he is being watched the spasm will be exaggerated; during rest and sleep the attacks tend to pass off.

Differential diagnosis.—In chorea, the convulsive movements are distributed more or less generally over the body, and are less intense; the same is true of myoclonus. When the spasm is tonic, rheumatic torticollis has to be excluded; in the latter there is much pain in the neck, and the muscles themselves are tender to pressure. Organic lesions of the cervical spine (tumour, spondylitis), may give rise to tonic spasm of the neck muscles; but the other symptoms by which they are characterized enable a correct diagnosis to be made. In congenital torticollis there are changes in the cervical spine and shortening of the muscles.

INDICATIONS FOR OPERATION.

Operation will only be undertaken when other methods of treatment have failed: when the patient prefers the chance of paralysis of the neck muscles to the condition of spasm from which he is suffering, and of the appearance of spasm in other muscles after the operation. Section, stretching, and even resection of the spinal accessory nerve has sometimes proved inefficient. Tenotomy of one or two of the tendons of the neck muscles is usually unsuccessful, but, as far as present experience goes, more success has attended the operation of Kocher and Quervain, in which the tendons of almost all the muscles of the neck are cut. This operation shows the greatest average number of successes, and next to it comes resection of the spinal accessory.

Contra-indications.—Operation will probably be inadvisable in cases in which some cerebral or spinal process appears to be the cause of the spasm, or in which some general neurosis is present.

Prognosis.—*Risks of the operation.*—Other neighbouring and previously unaffected muscles may develop the spasm soon after the operation, and the latter prove, therefore, useless. The paralysis which follows division of the nerve is often slight, and does not incapacitate the patient to any considerable extent.

Without operation no serious consequences are to be anticipated; in many cases treatment without operation is successful even when the condition has been present for a long time.

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PERFORATING ULCER OF THE FOOT.

Etiology.—This condition is usually due to some pathological change in the peripheral, or central nervous system. Among the most frequent of these are tabes,

syringomyelia, general paralysis, spina bifida, traumatic affections of the cord, leprosy, peripheral neuritis diabetic and alcoholic.

Clinical Course.—Perforating ulcer of the foot runs a painless and chronic course; it makes its way steadily into the deeper structures, and usually resists all local treatment; it tends to recur (Borchard-Nasse). In the neighbourhood of the ulcer, or over the whole foot, there is usually some anæsthesia, and certain trophic disturbances of the bones, joints, muscles, and nails. The most frequent situations for the ulcer are under the metatarsophalangeal joint of the great toe or of the little toe, or under the heel. The first local change is usually the formation of a corn, and suppuration takes place beneath this; an ulcer is thus formed, surrounded by an edge of thickened skin; the ulcer penetrates the soft parts, and reaching the bones gives rise to necrosis. A diffuse cellulitis may originate in the ulcer and spread to the tissues of the foot.

The Diagnosis is readily made from the characteristic appearance and situation of the ulcer. Its painlessness and other characters differentiate it from other forms of ulceration.

INDICATIONS FOR OPERATION.

The ulcer may be attacked directly, or the internal plantar nerve may be stretched, with a view to bringing about healing. These two procedures are often combined. Operation should be done when the ulcer does not improve in spite of immobilization of the foot, when, in spite of all care, infection and complications threaten, and when the condition returns again and again after treatment. In the working classes especially, operation will be called for, on account of the impossibility of keeping the foot at rest for a long period.

Prognosis.—*Results of operation.*—Chipault and his colleagues have recorded many cases of healing after nerve extension (Chalais collected 15 cases, 14 of which were successful); I have also seen favourable results follow the operation. In one of my patients who had had a perforating ulcer for several years, recovery took place after operation, and there was no recurrence two and a half years after, although he walked a great deal.

The risks of the operation are small. The stretching of the nerve gives rise to only transitory paralytic phenomena. In one case pain was complained of in the area of the posterior tibial nerve, and in another anæsthesia of the foot was present for some months. One case of rupture of the nerve has been recorded.

If no operation be done the ulcer is liable to be complicated by extensive cellulitis, and septicæmia and pyæmia are not uncommon. In a case which I have recently seen, a local cellulitis supervened, and was complicated by arthritis of five of the large joints.

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CHAPTER IV.

Neuroses.

Chapter IV.

NEUROSES.

EXOPHTHALMIC GOITRE.

Etiology.—This affection often develops in "nervous" individuals. Its appearance is often preceded by some violent emotional disturbance or fright. Direct heredity is rarely traceable; exhausting diseases somewhat frequently appear to be the causative factor; sometimes it follows chronic intoxications.

Clinical Course.—When fully developed the disease exhibits the following cardinal signs: exophthalmos, a vascular goitre, and tachycardia. In addition to exophthalmos, other eye symptoms occur: Graefe's symptom, diminution of the movements of the lids (Stellwag's symptom), and weakness of the muscles of convergence (Moebius' symptom). The goitre is often very soft and compressible; it pulsates, and a bruit and thrill are usually present. Pulsation is usually prominent throughout the arterial system, and bruits can often be heard in these vessels. Frequently the patient exhibits tremors of the fingers, states of depression and exaltation, loss of appetite, attacks of profuse diarrhœa, and excessive perspiration. The galvanic conductibility of the skin is usually diminished. The patient often loses flesh early; less commonly marked pigmentation of the skin is found, and œdema, either transitory or persistent, in the latter case of cardiac origin.

Exophthalmic goitre is said to be secondary when its characteristic symptoms develop some considerable time after the appearance of the actual goitre; primary when the latter appears at the same time as the other symptoms. Sometimes the development of the symptoms takes place in an acute form; occasionally one or other of the cardinal symptoms is absent.

Differential diagnosis.—Goitre, complicated by pressure on the sympathetic, is with difficulty distinguished from true Graves' disease. In such cases, however, the goitre does not show the vascular phenomena characteristic of Graves' disease, the sympathetic symptoms are one-sided, and signs of pressure on trachea and œsophagus are present. In some highly nervous individuals with goitre or exophthalmos it is sometimes difficult to be sure whether one has to deal with one of those forms of true exophthalmic goitre, to which reference has already been made, in which one or other of the cardinal symptoms is absent.

INDICATIONS FOR OPERATION.

There is much disagreement among different writers as to the advisability of operation. While some, for example Lemke and Kocher, recommend operation in all cases, others (Buschan) do not advise it under any conditions. The majority hold that under certain circumstances it is to be recommended. The presence of a voluminous goitre giving rise to symptoms which threaten to be fatal, such as tracheal compression, is an absolute indication for operation ; in such a case I have had to perform immediate tracheotomy. Operation is also absolutely indicated in acute Graves' disease, where the symptoms are making rapid progress.

Most authorities agree (*a*) That no operation should be done in ordinary cases, unless internal medication has been tried and failed, since spontaneous recovery takes place not infrequently ; (*b*) That operation should be undertaken in severe cases, provided that the patient's general condition is good, and that signs of commencing cachexia indicate early operation (Sorgo).

Certain external conditions may also render operation advisable : when the patient cannot take proper care of himself, when he is unable to continue his work, and when he himself has a fixed desire for the operation. A hard, goitrous tumour superficially situated is a recommendation to operation. According to Sorgo, a case must be considered severe, and therefore suitable for operation (*a*) When some particular symptom is present in a very pronounced form : for example, excessive exophthalmos indicates the advisability of resection of the sympathetic ; a very voluminous

goitre may render operation necessary for the relief of signs of compression; (*b*) When the disease progresses with marked rapidity; (*c*) When some complication threatens life, for example, cachexia, degeneration of cardiac muscle, disorders of the nervous system, etc.

According to Kocher, the rational operative procedure for exophthalmic goitre consists in a partial excision with ligature of the afferent arteries, often necessarily completed in several stages. Exothyreopexy and resection of the sympathetic do not give such good results.

Contra-indications.—These have already been discussed. Advanced cachexia is against operation. Considering the considerable risks attached to operation, internal medication should first be tried in all cases, although Kocher holds a contrary opinion.

Prognosis.—*The risks of operation.*—Often, either during or after operation, very unpleasant and dangerous symptoms supervene, which are attributable on the one hand to a lessened resistance of the organism, and on the other to the increased excitability of the nervous centres. On several occasions sudden death has occurred, and in other cases collapse and symptoms of severe general disturbance, tachycardia, and fever. A general anæsthetic is much more dangerous in a case of Graves' disease than in a case of simple goitre; for this reason Kocher advises that all cases should be operated on without a general anæsthetic. Previous treatment with iodine, or thyroid extract, makes the prognosis of operation worse, and the same is true of free hæmorrhage at the operation.

Results of operation.—By operation, or rather by several consecutive operations, the symptoms are often so improved that one is justified in speaking of actual cure. In a quarter of the published cases of the individual symptoms, the tachycardia and the exophthalmos were improved. Of the whole number in Sorgo's statistics, half (51·2 per cent) were improved, a fourth (27·9 per cent) cured, 6·4 per cent were not benefited or became worse, and 13·9 per cent died either during or directly after the operation. The results are not worse in primary than in secondary cases.

If no operation be done, the prognosis is guided by the following considerations: the disease is essentially chronic,

and causes death in only a small proportion of cases by cachexia or some other complication; even in its severe types spontaneous recovery may occur; in many cases the patient is quite unable to apply herself to any occupation or to enjoy life in any way. The acute cases, happily rare, run a relatively malignant course, and cause death in a higher percentage of cases.

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INTERMITTENT HYDRARTHROSIS.

Definition.—Intermittent hydrarthrosis is a designation used for cases in which distension of joints with fluid occurs at regular or irregular intervals without leaving any permanent anatomical changes.

Etiology.—This affection usually occurs in "nervous" individuals following some slight trauma, or some infection or intoxication. It usually occurs between the ages of ten and forty.

Clinical Course.—After some prodromal symptoms one or more joints become swollen without any accompanying fever. The effusion persists for several days and then disappears spontaneously, and this process repeats itself at intervals. As a rule the knee is affected, either alone, or with other joints; in sixty-four cases which I collected, only twice was the knee unaffected. The pain is sometimes intense and radiates to the regional nerves. There is no heart lesion. Often there are various nervous phenomena, and sometimes there are circumscribed œdematous swellings of the skin in other situations. The attacks sometimes show a definite relation to the physiological genital functions in their onset and their disappearance. The affection may persist for several years.

INDICATIONS FOR OPERATION.

Operation will be done only as a last resource, when all internal medical treatment has failed. Relatively good results have been obtained by puncture of the joint and injection of some irritating fluid.

Contra-indications.—No operation will be recommended when the affection has been present for only a short time; when it does not always attack one joint, but first one and then another; and when medical treatment has not been given a proper trial (arsenic, electric current, etc.).

PROGNOSIS.—*Results of operation.*—Operative treatment is unsuccessful in a relatively large proportion of cases; the process itself may not be improved, or may reappear in another joint. In one of my cases, puncture of the knee, repeated twice, had no influence either on the recurrence of the effusion, or on the severity of the attacks.

Without operation the attacks may recur for many years; sometimes they disappear suddenly; n other cases there may be long periods (notably during pregnancy) during which they remain absent; in others the effusion suddenly passes to other joints.

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CHAPTER V.

Diseases of the Larynx.

Chapter V.

DISEASES OF THE LARYNX.

STENOSIS OF THE LARYNX.

Etiology.—A variety of causes may give rise to laryngeal stenosis. In addition to diphtheria and certain nervous affections, there must be mentioned œdema of the larynx, syphilis, rhinoscleroma, tuberculosis, new growths and scars, and perichondritis laryngea.

Clinical Signs.—Laryngeal stenosis may be acute, subacute, or chronic. According to the rapidity with which the stenosis supervenes, one or other symptom may predominate. When it rapidly becomes extreme, signs of suffocation appear, the auxiliary muscles of respiration are called upon, the larynx descends deeply at inspiration, and inspiratory and often expiratory stridor are noticed. The laryngoscope often demonstrates the cause of the stenosis. If the onset is gradual, dyspnœa may be slight and only noticeable on exertion, but when the channel is narrowed, difficulty in respiration may come on at any time from the impaction of pledgets of mucus or crusts.

Differential diagnosis.—The site of obstruction can be demonstrated with the laryngoscope; when stenosis is laryngeal the voice is often affected.

INDICATIONS FOR OPERATION (extra-laryngeal).

It is necessary to open the larynx or trachea, (1) When dyspnœa is intense, whether the stenosis is of acute or chronic onset; (2) In cicatricial stenosis, where tracheotomy is employed for systematic dilatation with metal or rubber instruments; (3) In tumours of the larynx for the purpose of extirpation.

Contra-indications.—There are no contra-indications under the first heading given above. Systematic dilatation is a tedious proceeding, and may be contra-indicated by an

indifferent general state of health. Sloughing and necrosis of laryngeal growths contra-indicate tracheotomy unless suffocation threatens.

PROGNOSIS.—*Results of operation.*—Tracheotomy often saves life. The dilatation of stenosis through a tracheal wound is often successful in restoring the laryngeal passage. The possibility of removing a laryngeal or tracheal growth by operation within the channel will depend upon its extent and infiltration. When these are marked, a more radical proceeding will be necessary.

Risks of operation.—The risks of tracheotomy as such are very small in competent hands. However, when some septic process is present in the larynx, tracheotomy is not uncommonly followed by pneumonia or gangrene in the lungs.

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LARYNGEAL PARALYSIS OF NERVOUS ORIGIN.

ETIOLOGY.—Bilateral paralysis of the abductor muscles may be due to a central or a peripheral cause. Most often it follows tabes dorsalis. In all other central lesions involving the bulb (syringobulbar paralysis, progressive muscular atrophy), laryngeal paralysis is exceptional, and it is also rare in lead neuritis and other peripheral paralyses.

CLINICAL COURSE.—The bilateral laryngeal paralyses are the only laryngeal nervous paralyses of surgical interest. Of this group, bilateral recurrent laryngeal paralysis, a rare lesion, has not hitherto been submitted to any surgical treatment, for it gives rise to little interference with respiration or deglutition. In two of my cases the glottis was fixed in the mid position. There was slight stridor on deep respiration, and occasional difficulty in swallowing. Bilateral paralysis of the crico-arytenoids is, on the other hand, of surgical importance. The glottis is reduced to a small slit, and on inspiration the vocal cords come together ;

this gives rise to dyspnœa, always inspiratory in character. Inspiration is stridulous ; the voice, however, is unchanged, and may be quite clear and distinct. In many cases the degree of dyspnœa is small, and causes little distress.

DIAGNOSIS.—The affection is easily diagnosed when the contrast between the signs of inspiratory obstruction and the absence of any interference with the voice is noticed ; laryngoscopy will at once reveal the nature of the lesion.

INDICATIONS FOR OPERATION.

According to present knowledge, tracheotomy is the only surgical procedure indicated. It may be called for as a last resource when repeated attacks of dyspnœa threaten asphyxia, or when the narrowing of the glottis is extreme from swelling of the cords. Secondly, it may be indicated as a prophylactic measure when the patient, subject to these dyspnœic attacks, is so circumstanced that he is unable to obtain immediate surgical assistance if he should need it.

Contra-indications.—When dyspnœa is slight, and when assistance can be counted on in an emergency, operation is not called for.

PROGNOSIS.—*Of operation.*—Tracheotomy only relieves the dyspnœa ; it has no effect on the lesion ; as a rule the cannula has to be worn permanently.

When no operation is undertaken, marked narrowing of the glottis is astonishingly well borne if the paralysis supervenes gradually and if secondary contractures develop slowly. One of my patients was entirely without any subjective sensation of dyspnœa when sitting, and even when walking slowly, although he had to be excluded from the general ward on account of his loud inspiratory stridor, which could be heard on a quiet night in a court-yard at a considerable distance from his room. In my experience tracheotomy is rarely necessary in this affection if the patient remains under medical supervision and avoids over-exertion.

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DIPHTHERIA.

Etiology.—Infection with the diphtheria bacillus takes place usually through the tonsils, more rarely through the nose, pharynx, and larynx. Almost always there is a mixed infection with streptococci.

Pathological Anatomy.—Locally the affected area shows inflammatory changes going on to necrosis and the formation of adherent membrane. The local necrosis often causes considerable destruction by deep penetration. There may be more or less free membrane in the pharynx and larynx. The neighbouring lymph glands are usually enlarged. In about 20 per cent of cases there is myocarditis and consequent degeneration of the heart muscle. Bacteriology has shown that there is no true distinction between diphtheria and the so-called croup.

Clinical Course.—In the milder cases there is moderate pyrexia, the tonsils, uvula, and soft palate are dusky red, and show membrane at first in discrete spots, and later confluent ; this membrane may extend over the pharyngeal wall, to the nose and to the larynx. When the nose is involved there is a blood-stained discharge, nasal respiration is obstructed, the whole nose is swollen, and whitish or greyish particles of membrane may be seen in the nostrils. The larynx is especially often involved in " malignant " diphtheria.

The malignant or septic form develops rapidly, with severe general symptoms. The lymphatic glands are early swollen and tender. Within the first three days the patches of membrane are replaced by septic gangrenous ulcers, bleeding easily and foul smelling. The temperature is usually high, but occasionally subnormal. The pulse rapidly weakens, and the profound intoxication induces delirium, stupor, and paralyses, with increasing cyanosis and marked renal changes. Death occurs in very many of these cases.

When the larynx is involved the voice is changed and cough is troublesome ; inspiratory stridor (croup) is usually noticed about the second or third day, and membrane is seen on the cords with the laryngoscope. In true diphtheria, however, the pharynx, larynx, and trachea may show only catarrhal swelling. With increase in the obstruction of the

glottis, dyspnœa becomes more intense; occasionally the patient may have temporary relief after coughing up membrane. When untreated, a patient with laryngeal diphtheria usually dies in from four to seven days with symptoms of asphyxia. Sometimes the process extends into the bronchi, but no peculiar symptoms other than those of laryngeal diphtheria arise from this extension. When recovery occurs in the severe type of the disease, convalescence often takes many weeks.

Diagnosis and Differential Diagnosis.—Bacteriological examination, and the fact that the posterior pharyngeal wall is often as much involved as the tonsils, serve to distinguish diphtheria from follicular tonsillitis. With regard to pseudo-croup, the attacks in this affection occur at night, respiration is unaffected during the day, the attacks are short, and there is no membrane in the larynx. The aspiration of foreign bodies has often given rise to a mistaken diagnosis of diphtheria.

INDICATIONS FOR OPERATION.

Indications for operation have been formulated by many authors; some favour the early and others the late operation. Baginsky advises operation when inspiration is prolonged, expiration noisy, and the chest is indrawn, also when attacks of dyspnœa occur, even in a moderate degree, with sensations of apprehension. One should never await the onset of signs of asphyxia, cyanosis, or pallor, coldness of the extremities, and diminution of cutaneous sensibility (Baginsky). Most writers advocate early operation. This surgical intervention may take the form of intubation or tracheotomy. It should be a rule to practise intubation primarily, when the respiratory difficulty appears. It may be adopted as a secondary measure when, after tracheotomy, it is found difficult to remove the cannula. If intubation cannot be done for any reason, then tracheotomy must be the primary procedure. If intubation does not relieve the breathing, tracheotomy should follow, and this may be also necessitated by repeated coughing out of the intubation tube, by the presence of pneumonia, by difficulties in feeding, by blockage of the tube and threatening suffocation, and by the breaking of the thread attached to the tube and the impossibility of expressing it. Generally, it may

be said that primary tracheotomy should be done when the following signs are present: asphyxia and pronounced heart failure, marked infiltration and œdema of the soft parts about the entrance to pharynx and larynx, retro-pharyngeal abscess. It is also indicated when the patient is not in hospital, and surgical aid is not immediately available. The recommendation of primary tracheotomy in cases where the diphtheritic process has extended far into the trachea is largely theoretical; this can rarely be recognized until the trachea has been actually opened.

Intubation versus Tracheotomy.—Intubation is a relatively insignificant procedure, and can usually be easily and rapidly performed. No anæsthetic or assistants are necessary; there is no risk of hæmorrhage, which may be troublesome during and after tracheotomy; and there is no wound to be infected (Ganghofner). Treatment is less prolonged after intubation than after tracheotomy, and it is easier to gain the consent of the relatives to the former than to the latter.

Contra-indications.—The contra-indications have been already mentioned. When there is much secretion of tenacious mucus, tracheotomy rather than intubation is indicated.

Prognosis.—*Risks of intervention.*—Intubation is an operation that requires a practised hand, and much damage may be done to the larynx by unskilful introduction of the tube. If the tube be left in long it may cause ulceration and subsequent cicatricial contraction; feeding is somewhat interfered with, and removal of the tube may occasion severe respiratory embarrassment. The latter may also be set up when the tube is introduced by the pushing down of membrane into the trachea, and sometimes the tube is coughed out and the patient threatened with suffocation.

In low tracheotomy, hæmorrhage may be troublesome both during and after operation. Occasionally erysipelas, cellulitis, or diphtheritic inflammation occurs in the tracheotomy wound. When some paralysis of deglutition appears at the same time, pneumonia is to be feared.

Results of intervention.—Intubation and tracheotomy often save life, especially in cases where antidiphtheritic serum is administered, giving time for the serum to produce

its curative effect. Secondary intubation is often very successful in overcoming the difficulties attendant on removal of the tracheotomy tube. Secondary tracheotomy, practised when intubation fails to give relief, is not often successful, because in such cases the diphtheritic process is generally descending. The prognosis of tracheotomy depends very much on the character of the attack. It is bad when the operation is done on a patient in asphyxia or below the age of two years. The progress of the disease when no operation is done has been referred to in the description of the clinical course.

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CHAPTER VI.

Diseases of the Bronchi and the Lungs.

Chapter VI.

DISEASES OF THE BRONCHI AND THE LUNGS.

BRONCHIECTASIS.

Etiology.—The most important etiological factors are chronic bronchial catarrh and chronic interstitial pneumonia, with or without pleurisy. Bronchiectasis may also occur from the blocking of the lumen of a bronchus by scar or foreign body, or from pulmonary emphysema. It occurs rarely as a congenital condition in atelectatic lungs.

Pathological Anatomy.—A distinction is made between the common (vicarious) diffuse cylindrical and spindle-shaped form and the rarer sacciform (inflammatory) type. The parenchyma between the bronchiectatic cavities, notably in the sacciform type, is more or less shrunken and destroyed. The changes may involve a single bronchus or a whole group connected with one or several pulmonary lobules; the size of the resulting cavity varies from that of a bean to that of the closed fist. The cavity may lie close to the thoracic wall or near the hilus. Ulcerative processes occur in the walls of the bronchi, giving rise to hæmorrhage, and becoming gangrenous; sometimes they heal and form cicatrices. When the cavity is superficial and the lung much shrunken, pleural adhesions develop.

Clinical Signs.—Frequently there are no characteristic symptoms, only those of a chronic catarrh, and such cases are of no surgical importance. In other cases the signs of cavity (cf. "Gangrene of the Lung") are well developed and the expectoration is copious. This expectoration may occur in great quantity at some particular time of the day (morning), or when the patient adopts some particular attitude. One of my patients expectorated more than a litre of sputum daily for a year. The sputum is purulent, and, when putrid bronchitis is present, it is very foul smelling; it forms

three layers on standing; in uncomplicated bronchiectasis, fragments of lung and elastic tissue are not found. The expectoration often also contains blood. Fever and loss of flesh occur in some cases, not as a rule until the condition has been present for a considerable time. "Drumstick" fingers and clubbed toes are often to be noted. In long-standing cases complications are relatively common, such as cerebral abscess and arthritis. Amyloid disease is unusual; in some cases there is an associated empyema.

Diagnosis.—The diagnosis is based on the chronic nature of the affection, on the copious and characteristic sputum, on the signs of cavity more or less evident according as the cavity is full or empty of secretion. Retraction of the thorax, and a certain amount of displacement of the neighbouring organs (heart) towards the affected side, point to the presence of a chronic interstitial pulmonary process and adhesions between the pleura and the thoracic wall, and support the diagnosis of bronchiectasis. The physical signs of cavity will indicate the situation of the lesion, and a radiographic picture may furnish corroborative evidence.

Differential diagnosis.—It is often difficult to distinguish this affection from tuberculosis. Absence of tubercle bacilli and of elastic fibres from the sputum, the character of the expectoration, the chronic course, and relatively good general condition, will aid in the diagnosis, and the fact that the apices are usually only slightly, or not at all, affected. Sometimes the question of an empyema emptying itself into the bronchi may arise; in such cases the history is of special importance, pointing to a preceding pleuritis. If there is a history extending over a year or more, the condition is almost certainly a bronchiectasis. With regard to pulmonary abscess, the history will also be of great assistance; pneumonia or trauma shortly preceding will point to abscess; in abscess also, fragments of lung tissue are found in the sputum, and are absent in uncomplicated bronchiectasis.

INDICATIONS FOR OPERATION.

There is at present some difference of opinion as to the indications for the opening of bronchiectatic cavities. There cannot be said to be any absolute indications, but a

relative one is present when the patient, in the course of his complaint (notably when it is complicated by putrid bronchitis), has to give up work, loses flesh rapidly, becomes melancholic, and cannot mix with his fellows. In such cases operation is, however, only to be recommended when the signs point to a single, unilateral, and superficial cavity, and when the discharge does not escape readily. The large sacciform cavities of the lower lobe are particularly suitable for operation. If the cavities are numerous, and putrid bronchitis is present, with much expectoration, and if the process is limited to one part of the lung, then *rib resection* over an area corresponding to the disease will favour the falling in of the lung and cicatrization of the foci.

Contra-indications.—No operation should be advised when both lungs are affected, when the condition, although confined to one lung, is very extensive, when the cavity is deep-seated, when the general condition is good and there is no putrid bronchitis, and when waxy disease is well established. Operation may be useless from the development of further cavities, and the thoracic fistula that is established may not be any improvement on his former condition. In one of my cases the cavity was exactly localized and was opened; after several months other cavities had formed to such an extent that his troubles were equal to those before operation, with the addition of a thoracic fistula.

Prognosis.—*Risks of operation.*—The operation and its consequences must be considered serious; Tuffier's statistics show a mortality of about 25 per cent. In view of these risks it should be remembered that bronchiectasis is compatible with long life. Rib resection (Quincke) is not a procedure attended with any particular risk.

Prognosis of operation.—Complete healing of a cavity by operation has been only exceptionally obtained. As a rule the cavity gradually shrinks, but a fistula persists. Rib resection may be followed by a good result when the disease is limited to a small area. In addition to the statistics of Tuffier already quoted, Garré has reported fifty-seven cases of operation by opening the cavity; of these twenty-one died, either immediately after or within the first week.

Without operation the cavity increases in size, but this

brings no risk to life, and waxy disease or other complications may not occur for many years.

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GANGRENE OF THE LUNG.

Etiology.—Gangrene of the lung most frequently occurs as a direct consequence of pneumonia. Tuffier records seventy-four cases operated on, fifty-five of which followed pneumonia. Predisposing causes are chronic alcoholism, exhausting diseases, diabetes mellitus, putrid bronchitis. Pneumonia caused by the aspiration of foreign bodies is often followed by gangrene, and the same is true of the pneumonias set up by the embolic carrying of septic material to the lungs by way of the jugular or uterine veins. Consecutive gangrene often occurs when ulcerative and septic processes spread to the lung from some adjacent site, such as the œsophagus, spine, larynx, trachea, and mediastinum.

Pathological Anatomy.—Gangrene is sometimes circumscribed and sometimes diffuse. The former may occur as a solitary focus or as multiple foci. In the latter case both lungs may be affected, but usually the gangrene is confined to one. Following the necrosis of lung tissue, cavities form, varying in size from that of a nut to that of the fist ; they are bordered by sloughing lung tissue, often communicate freely with a bronchus, and not infrequently extend to the pleural surface. The large vessels in the neighbourhood are often thrombosed; the overlying pleura is usually inflamed; and either adhesions form or pus collects in the pleural cavity. When diffuse the gangrenous process may involve a whole lobe ; it is not limited by any suppurating zone.

Clinical Course.—In cases of pneumonia, gangrene is to be suspected when the expectoration becomes more copious and putrid, with rise of temperature and increase of the cough. In some cases there is no increased fever.

The expectoration forms three layers on standing, the lowest of which contains yellowish-grey Dittrich's plugs, and often black pigmented fragments of lung tissue. Elastic fibres are relatively rarely present in any numbers, and hæmorrhages are not common. In the lung the focus can often be located, even when it does not lie superficially, by the presence of coarse metallic rales with or without amphoric breath sounds. Other signs of cavity are often present: tympanitic percussion, changing to dullness when the cavity is filled with secretion, alternating percussion note when the mouth is opened and closed, *bruit de pot fele*. In addition to the symptoms already mentioned, rigors and sweating are not uncommon. In cases of long standing, metastatic abscesses may appear, in the brain and elsewhere. Sometimes the disease resembles enteric fever in its onset, with sustained fever, stupor, and sordes of the mouth and lips.

Diagnosis.—This is usually easy. The fœtor, associated with the presence of gangrenous lung fragments in the sputum is quite characteristic. It is more difficult to localize the gangrenous area and to decide whether there is a solitary focus or several. The signs of cavity are those on which the local diagnosis must be based, and a radiographic examination may assist.

Differential diagnosis.—The condition has to be differentiated from putrid bronchitis with or without bronchiectasis, but in the latter fragments of lung tissue are not found in the sputum. In an empyema or a subphrenic abscess which ruptures into a bronchus, there are special percussion and auscultation phenomena, and the viscera are displaced.

INDICATIONS FOR OPERATION.

Free opening of the cavity is the only justifiable operation ; the exploring needle should not be used on account of the risk of infecting the pleural cavity. When a circumscribed area of gangrene is definitely diagnosed the indication for operation is absolute. The presence of pleural adhesions is favourable for operation, but their absence is no contra-indication. When all the diagnostic signs already described are present the fact that the focus lies deeply is no bar to operation. When the typical signs of cavity are absent,

operation should still be undertaken when the following signs are present (Riegner, A. Fränkel): (*a*) A circumscribed patch of dullness, notably in the lower lobe, with normal lung tissue all around it; (*b*) Fragments of lung tissue in the sputum in abundance, coughed up within a short period: (*c*) A shadow in the skiagram corresponding exactly with the patch of dullness revealed by physical examination.

If there is high sustained fever associated with rigors, operation should be done even when the focus is not superficial. Operation is urgently called for when the condition is complicated by empyema, and also when the gangrenous area is apical, as a focus in this situation is particularly dangerous.

Contra-indications.—Even when the diagnosis is certain, no operation should be done when the gangrene is diffuse, when the foci are multiple, when the condition is bilateral, or when there already exists some cerebral or meningeal lesion. When the focus is very small the case is not as a rule suitable for operation, because the diagnosis cannot usually be definitely settled, and definite localization must always be looked upon as an essential preliminary. In diabetics, when the urine contains a large quantity of sugar and acetone, operation is inadvisable.

Prognosis.—*Of operation.*—The earlier the condition is operated on, the better the prognosis. Exploratory puncture and the evacuation of the cavity with a trocar are very dangerous procedures. Tuffier estimates the mortality after pneumotomy as 40 per cent; Garré gives the mortality of 122 cases as 34 per cent; the prognosis varies with the etiology of the condition. In post-pneumonic gangrene the mortality is high; in cases where the condition follows pulmonary embolism it is still higher. Recovery after operation occurred in 60 per cent of Tuffier's collected cases; it is usually complete and permanent. Usually there is no risk of pneumothorax, because in most cases there are pleural adhesions.

Prognosis without operation.—In about 60 per cent of cases death occurs from exhaustion, or from some complication such as brain or liver abscess or pneumothorax. In many subacute cases the depression of vitality is very pronounced, and waxy disease may develop. In all cases of

circumscribed gangrene there is a risk of the process extending to other parts of the lung by aspiration, or of a general infection.

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ABSCESS OF THE LUNG.

Etiology.—Pneumonia is the most common antecedent of pulmonary abscess, and its occurrence is favoured by previously existing emphysema or induration processes. Abscess also occurs from embolism, especially in pyæmia and puerperal sepsis; also from wounds and the introduction of foreign bodies into the bronchi.

Pathological Anatomy.—With the exception of the post-pneumonic cases, abscess arises in lungs previously healthy. The pneumonic abscesses are usually situated in the lower lobe, those due to foreign bodies develop wherever the foreign body lodges, and this usually occurs in the right primary bronchus or in a secondary bronchus in the right lower lobe. Abscesses may be single or multiple, and in size vary from that of a nut to that of the fist. The antecedent pneumonia is often due to the Fraenkel-Weichselbaum diplococcus or the influenza bacillus, but in many cases to organisms other than these. In recent abscesses the walls fall in when the contents are evacuated; the pus may be inodorous, but in cases where there is associated gangrene it is foul smelling. In abscesses of long standing the walls are infiltrated and dense. Lung abscesses may be near the surface or deeply situated; in the former there is usually pleurisy with adhesions or

purulent effusion, but in many cases there is no pleurisy at all.

Clinical Course.—There are local and general symptoms. Of the latter a sustained pyrexia is the most important. In cases following pneumonia the temperature may remain up, or pyrexia may set in again after the crisis. At the same time, or shortly after, the patient expectorates in considerable quantities a purulent creamy secretion, often possessing a somewhat sweetish smell. In this pus there are often fragments of lung tissue and elastic fibres in considerable amount, hæmatoidin crystals and fat crystals. Physical signs of cavity are often not to be found when an abscess is deep-seated, or may develop while the patient is under observation. A change in percussion note at one spot, from dull to tympanitic, after the patient has got rid of a quantity of expectoration, associated with bronchial breathing and the other various signs of cavity, may be looked upon as diagnostic. In many cases, however, especially when the abscess is in the lower lobe, the signs of cavity are wanting, owing to collapse of the walls when the collection of pus is discharged. When, after pneumonia, a circumscribed patch of dullness persists, surrounded by normal lung tissue, if the expectoration is abundant and purulent, if fever persists and if a skiagram shows a shadow corresponding to the dull area, a diagnosis of abscess may be confidently made.

Diagnosis.—Radiography is a valuable aid in localizing an abscess ; when clinical signs suggest multiple abscesses it may also be of much assistance. When an abscess is due to the presence of a foreign body, this may be seen in a skiagram while the process is in an early stage. In a recent abscess, if the sputum becomes fœtid, this points to its extension by gangrene of the wall. The following signs point to the presence of pleural adhesions around an abscess : relative immobility of the ribs over a limited area, with inspiratory retraction of the intercostal spaces over the same area; lessened inspiratory movement of the lower border of the lung; no alteration in heart dullness on deep inspiration and maximal expiration. When there has been antecedent pleuritis, adhesions are probably present.

The differential diagnosis does not, as a rule, present

any particular difficulty. Against bronchorrhœa are the signs of cavity, and the presence of elastic fibres and lung fragments in the sputum; the latter also exclude bronchiectasis. Tuberculosis is excluded by examinations of the sputum for tubercle bacilli. When an empyema opens into a bronchus the discharge of pus is often followed by the signs of partial pyopneumothorax, metallic auscultation, percussion phenomena, and hippocratic succussion.

INDICATIONS FOR OPERATION.

When there are definite signs of an acute solitary abscess, or of several abscesses situated close together in one lobe, operation should be undertaken without delay, unless there are signs of spontaneous healing. The condition should not be allowed to become chronic (Quincke). If spontaneous recovery occurs the process takes from three to ten weeks, and will be indicated by decrease in the discharge of purulent sputum and decline of the fever. In one of my own cases it was decided to forego operation on account of the diminution in the amount of sputum, and spontaneous recovery took place in the course of a few weeks. An exact localization is an essential preliminary to operation, and it must also be definitely ascertained that there is only one abscess, and that it is not of very small size. When the general symptoms are of a severe type, with high fever and abundant expectoration of pus and lung débris, and when physical examination shows a definite local area of infiltration in the lower lobe, pneumotomy is justifiable, even in the absence of signs of cavity, when the patch of dullness is surrounded by normal lung tissue. Foci in the lower lobe behind are the most favourably situated for operation; signs of pleural adhesions will make one recommend operation the more readily. Chronic abscesses, with copious and particularly with putrid secretion, should be operated on by resection of several ribs, free opening of the cavity and, if necessary, partial excision of the abscess wall.

In abscesses due to the presence of foreign bodies, pneumotomy is only indicated when the foreign body cannot be extracted by the respiratory channels, when the discharge of pus is copious, and the signs of general disturbance are serious Puncture, without opening the

thoracic cavity, is a most dangerous proceeding, and should never be done.

Contra-indications.—No operation should be done when there is reason to believe that there are multiple abscesses present, and this is particularly to be expected in pyæmia, puerperal sepsis, and influenza-pneumonia. Operation is also contra-indicated when there are no local signs of cavity with moderate fever, and no alarming symptoms of general disturbance; often in such cases eventual recovery takes place by discharge of the pus through the bronchi. With few exceptions, which have already been alluded to, abscesses due to foreign bodies are not suitable for thoracotomy.

Prognosis.—*Of operation.*—In acute cases statistics show recovery after operation in 73 per cent; death in 27 per cent. In chronic cases the recoveries were 51 per cent; 23·5 per cent improved, and there were 25·5 per cent of deaths. In more than two-thirds of the acute cases, therefore, operation cured; in cases complicated by gangrene the prognosis is much worse. The prognosis is less favourable in chronic cases, particularly when the discharge is fœtid; thoracic fistulæ often persist. The advantages of pleural adhesions, from the point of view of operation, have been already mentioned.

If no operation be done the abscess may extend, empyema or pyopneumothorax may develop, or general septic infection may supervene and cause death. An acute abscess often becomes chronic, and the strength may be exhausted by constant and long-continued discharge. On the other hand, many pulmonary abscesses disappear spontaneously by evacuation through the respiratory channels. (See "Indications.")

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PULMONARY TUBERCULOSIS.

There is no need to describe here the etiology and clinical course of this affection. The indications for surgical interference have not yet been settled with sufficient precision to allow one to formulate any exact rules. Many cases have been submitted to operation, but these have been of such diverse types, and the methods of operation have varied to such an extent, that the records do not furnish material for forming any precise opinions on the question.

The subject has been recently discussed by Quincke, who has devoted so much attention to lung surgery, and by Garré. According to these authors the indications for operation are as follows: only when the patient's general health is still good, and when he presents a single circumscribed focus of disease, is operation to be thought of. In such a case, when there are signs of retention and decomposition of secretion, and symptoms of septic absorption, the cavity should be freely opened and drained. In the rare cases of isolated cavity and tubercular focus in the lower lobe, the infiltrated lung tissue should be resected, followed by thoracoplasty. In stationary isolated cavities of the apex, the thoracic wall should be mobilized by resection of the first three ribs, without opening the pleura (Garré).

Quincke has further expressed his views as follows: When one can say with some degree of certainty that, apart from the question of cavity, the tubercular process in an advanced stage is confined to one upper lobe, present experience indicates that mobilization of the corresponding thoracic wall by thoracoplasty is a justifiable proceeding, and that when combined with other treatment encapsulation and healing of the focus may be brought about thereby.

The chief difficulty lies in the fact that cases of definitely circumscribed pulmonary tubercle are only rarely met with, and such alone are suitable for operation; in most cases it is difficult to be certain that the disease is really strictly limited. In opening cavities there is a danger of setting up a gangrenous process; there is also the risk that a permanent thoracic fistula may result, or that healthy lung tissue may be infected by the contents of the cavity.

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HYDATID CYST OF THE LUNG.

Pathological Anatomy.—As a rule there is a single cyst in one of the lower lobes, most frequently the right, and the cyst is almost always unilocular. It may reach the dimensions of an infant's head, and not infrequently ruptures into a bronchus or into the pleural cavity. Sometimes suppuration occurs in the cyst, and even calcification. When suppuration supervenes there are usually inflammatory changes in the surrounding parts, infiltration, empyema, and occasionally gangrene.

Clinical Signs.—Occasionally there are no symptoms. Very often there is very troublesome cough, sometimes associated with hæmoptysis and attacks of dyspnœa. When there is dullness to percussion it often presents a characteristic vaulted outline; as a rule râles are absent. Over the dull area breath sounds are usually absent, or there may be indistinct bronchial breathing. The neighbouring organs are often dislocated. If suppuration occurs and the pus is discharged into a bronchus, signs of cavity may appear. Suppuration is of course associated with fever. Particles of membrane and vesicles are comparatively frequently coughed up.

Diagnosis.—The diagnosis is not usually made until membranous particles or vesicles are coughed up, or fluid containing scolices is found by exploratory puncture. If fluid obtained by puncture is limpid, free from albumin but rich in sodium chloride, there can hardly be any doubt that the condition is one of hydatid cyst. If pus is drawn off, the discovery of hooklets in it will show the nature of the case. Signs of hydatid elsewhere will aid early diagnosis, when there is a patch of lung dullness with absence of breath sounds and displacement of neighbouring organs.

Differential diagnosis.—The signs just mentioned will be sufficient to distinguish hydatid cyst from pleurisy with effusion, interlobar pleurisy, chronic pneumonia, and similar affections.

INDICATIONS FOR OPERATION.

If the diagnosis is certain and the position of the cyst ascertained, it should be opened through the pleura and lung unless it is very deeply situated. The absence of pleural adhesions fixing the lung is no absolute bar to operation. If suppuration has set in, operation should be done with the least possible delay.

Contra-indications.—When a skiagram shows the cyst to be close to the hilum, operation is inadvisable. With this exception there are no contra-indications, provided that the general condition of the patient has not been allowed to become very bad.

PROGNOSIS.—*Results and risks of operation.*—In many cases a complete cure has been obtained, in others a thoracic fistula persists. The risks of operation are at present considerable. In one of my cases where the cyst had suppurated and where it was only possible to make a simple incision, death followed in a month from waxy disease due to the chronic discharge.

If no operation be done the prospect is that the cyst will grow, eventually become infected and cause death from exhaustion. Without operation about 60 per cent of the cases die.

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ACTINOMYCOSIS OF THE LUNG.

ETIOLOGY.—Pulmonary actinomycosis usually results from the aspiration of infected barley grains into the bronchi. More rarely it is secondary to actinomycosis of the mouth.

PATHOLOGICAL ANATOMY.—At the site of the disease the lung is usually collapsed, thickened, and infiltrated with dense connective tissue, and often interspersed with

small pus-containing cavities. As the disease progresses the pleura is greatly thickened and adherent, and the skin becomes of a board-like hardness from infiltration. The skin, pleura, and lung are often riddled with fistulous tracts. When the disease is extensive there is much sclerosis and shrinking of the lung.

Clinical Course.—In typical cases three stages may be distinguished (Israel). First there is bronchial catarrh, followed by signs of interstitial infiltration of a lower lobe and the formation of cavities and general symptoms resembling those of tuberculosis, fever, loss of flesh, pallor, and sweating. In the second stage there are pleural signs, adhesions, etc., and retraction of the thoracic wall is often to be noted. In the third stage the skin becomes involved and suppurates, with the formation of multiple sinuses. In the pus the characteristic golden yellow granules are to be seen, and in the sputum often elastic fibres in addition.

Diagnosis and Differential Diagnosis.—The condition may easily be confounded with tuberculosis; the absence of tubercle bacilli and the presence of the actinomycotic grains are the only signs by which the distinction can be made.

INDICATIONS FOR OPERATION.

Actinomycosis of the thoracic wall over an infiltrated lung warrants operation; sinuses often lead directly from the skin into the lung disease. Some surgeons hold the view that operation should not be done unless septic infection of the skin supervenes.

Contra-indications.—When the general condition is bad and the lung disease very extensive, no operation will be recommended.

Prognosis.—*Of operation.*—Complete success is rarely obtained; usually the lung disease has advanced too far by the time its nature is revealed by involvement of the skin. Occasionally the whole area of disease has been successfully removed, but usually its extent is so great that this is impossible, and only partial excision can be done.

Without operation recovery may be anticipated under expectant treatment in a fair number of cases, but in the great majority the disease proves fatal.

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CHAPTER VII.

Diseases of the Pleura.

Chapter VII.

DISEASES OF THE PLEURA.

PLEURISY AND EMPYEMA.

Etiology.—In a certain number of cases pleurisy is a primary affection, and in the majority of these the disease is of tubercular nature. In a second group of cases pleurisy is secondary to disease of adjacent organs, and to this class belong the para- and metapneumonic pleurisies, pleurisy following abscess, gangrene, infarct, and tumours of the lung, bronchiectasis, and mediastinal affections, and those secondary to disease in the abdomen, subphrenic abscess, peritonitis, malignant growths of the intestine and stomach, affections of the liver. In a third group the disease is of a metastatic type occurring in the course of, or following, some general infective process, puerperal sepsis, the acute exanthemata, erysipelas, diphtheria, acute rheumatism. Lastly, it may occur in association with some general dyscrasia, gout, scorbutus, morbus maculosus, renal disease. In serous pleurisy the common pyogenic organisms are usually found, tubercle bacilli only occasionally. In metapneumonic cases the *Diplococcus Fraenkel-Weichselbaum* is the usual organism. In empyemata the pyogenic organisms, and particularly streptococci, are found.

Pathological Anatomy.—In both the dry and the exudative form the pleura becomes covered with membrane when the affection has been present for a long time. The effusion may be serous, purulent, hæmorrhagic, putrid, or chylous ; unless there are limiting adhesions it occupies the lowest part of the pleural space. As the exudate is absorbed, adhesions may shut off separate fluid-containing spaces. When the inflammatory changes are intense, dense adhesions may form between lung and chest wall, and cause retraction of the latter.

Clinical Course.—The early symptoms of pleurisy are often very slight, and even large effusions may form unrecognized; this is especially true of the tubercular type. Usually there is pain in the side, immobility of the affected half of the chest, and cough; but when effusion is encysted there is often no cough. Fever may be absent; when it develops it indicates an extension of the inflammatory process; when the latter becomes stationary the fever usually intermits, and when the exudation is becoming absorbed the temperature returns to the normal. If the onset is attended by rigor, it suggests a complicating pneumonia, or that the disease is embolic or septic in character. When the effusion is large the tension of the pulse falls, and diuresis diminishes. Friction is heard at the beginning, and towards the end when there is effusion; and from the time of the appearance of the latter, percussion dullness can be made out, and the affected side of the thorax bulges and becomes more or less immobile. The outline of the limits of the effusion will vary somewhat according to the attitude adopted by the patient.

When the amount of exudation is large the neighbouring organs are displaced. When it is on the left side there is dullness in Traube's semilunar space. One of the most important signs is the unilateral enlargement of the thorax, though it must be remembered that normally the left side is $\frac{1}{2}$ to $1\frac{1}{2}$ cm. smaller than the right. Sometimes there are attacks of syncope and collapse, but sudden death is rare.

When, in a patient who has had pleurisy, an area of dullness is present with an irregular outline, and when in this area the other physical signs of fluid are also found, a diagnosis of encysted exudation is indicated. When the lung is adherent to the chest wall, breath sounds will be audible at the point of adhesion. It can only be certain that there is more than one separate collection when the exploring needle obtains fluid of different character at different points, or when, after complete evacuation with the aspirator, more fluid is obtained from some other spot. The exploring needle should be used in all cases of pleurisy with effusion, for the purpose of discovering the exact character of the fluid. An empyema spontaneously discharges through the chest wall only when it is associated with some acute septic or gangrenous process; occasionally

empyemata are pulsatile. When an empyema discharges through the lung the patient coughs up very large quantities of pus, and signs of pyopneumothorax appear. Metapneumonic empyemata often heal spontaneously by this evacuation through the respiratory channels.

Differential Diagnosis.—In pneumonia the fever is higher and more sustained, the chest wall on the affected side is not bulged, the intercostal spaces move with respiration, and the other known physical signs of pneumonia are present. Sometimes there is difficulty in distinguishing between bronchiectasis and empyema; when repeated examination gives variable results in the physical signs, bronchiectasis is the more probable. New growths involving the pleura are associated with very severe general symptoms: the supraclavicular glands are usually enlarged, the area of dullness is irregular, the exudate is often hæmorrhagic, and when the exploring needle is used there is a sensation of passing it through a hard mass. In subphrenic abscess the diaphragm is pushed upwards in a dome-shaped manner usually on both sides, and there are also signs pointing to abdominal disease and peritonitis. Hydrothorax is apyrexic, often bilateral, and there is no friction, while there will be present other signs of circulatory disturbance.

INDICATIONS FOR OPERATION.

The different operative procedures must be discussed separately.

1. Paracentesis Thoracis is absolutely indicated in serous effusions under the following circumstances:—

(*a*). When the effusion is endangering life; dangerous symptoms are—continuous or intermittent severe orthopnœa, attacks of syncope, a small pulse, cyanosis of the skin and mucous membranes, marked engorgements of the veins of the neck, extreme displacement of the neighbouring organs, particularly the heart; these symptoms occur when the effusion is very large in amount, and provide an indication for thoracocentesis without delay.

(*b*). When other methods are attended with unsatisfactory results. If an effusion persists for several weeks, and is not diminished by expectant treatment with drugs, etc., it should be drawn off. It will depend upon the amount of the effusion how early aspiration will be indicated. As a rule

it will not be called for before the third week, and it should not be done whilst fever due to the pleurisy persists, unless there is some exceptional reason for resorting to it early; however, even if fever continues, aspiration should not be put off if the effusion is progressive, or remains stationary; sometimes it has to be repeated. The best results are obtained when fever is absent, or at least declining, and when the effusion is stationary, and the urinary secretion small. This is true for tubercular pleuritic cases, as well as for others.

(*c*). When the distress of the patient is intolerable; this is especially the case in patients who have an associated lung disease. tuberculosis, neoplasm, etc.

In hæmorrhagic effusions the indications under the headings *a*. and *c*. are alone pertinent. In a case of endothelioma pleuræ under my care I practised thoracocentesis almost weekly for several months, the effusion constantly threatening death.

Chylous effusion should, as far as possible, only be drawn off when the fluid has ceased to increase in amount, and has been stationary for several weeks.

Contra-indications to Paracentesis.—A sustained temperature is a contra-indication during the first three weeks unless there is danger to life, and this operation is also inadvisable when the effusion is hæmorrhagic or chylous, unless it is very large in amount and producing serious symptoms. If the fluid be removed under these circumstances it will rapidly reaccumulate, and the operation will have to be repeated. In cases of serous effusion following pneumothorax, in which the air has been reabsorbed, and also in cases of effusion after hæmorrhagic infarct of the lung, it is wise not to remove the whole of the fluid, and not to aspirate with high suction pressure, because the visceral pleura is exceptionally friable in these conditions (Gerhardt).

Risks and accidents of Thoracocentesis.—With patients who are seriously ill sudden death may follow aspiration, especially when large quantities of fluid (over 1500 cc.) are removed at one time. Such deaths occur from thrombosis of the pulmonary veins and embolus; some are due to cerebral anæmia. In exceptional cases death occurs from hæmorrhage into the pleural cavity, or injury to the lung. Pneumothorax is a comparatively frequent

occurrence after aspiration, and is very often overlooked ; as a rule, in my experience, it disappears in the course of three or four days without causing any alarming symptoms.

Sometimes after paracentesis there is expectoration of clear fluid, rich in albumin, in large quantities ; this usually ceases after a few hours. The formation of a fistula through the puncture is very unusual ; when aseptic precautions are taken the conversion of serous into purulent effusion need not be feared.

Results of Paracentesis.—The dyspnœa diminishes, the displaced organs regain their normal situations unless adhesions have formed, the pulse becomes fuller and slower, diuresis increases, and the bulging of the thorax disappears. In many cases the effusion is finally cured by the operation.

Paracentesis in Empyema.—This should only be employed when it can be combined with continuous aspiration-drainage after the method of Bülau ; but this method is rarely employed now. Exceptionally, it is indicated as a preliminary to thoracotomy when the symptoms call for urgent relief.

2. Thoracotomy.—This operation is indicated :

(*a*). When the effusion is purulent, provided that the patient's general condition is sufficiently good. It should be done as soon as the purulent nature of the fluid is recognized, except, perhaps, in the metapneumonic empyemata of children ; according to Gerhardt it is not uncommon in the latter cases for spontaneous recovery to take place by rupture of the fluid into the respiratory passages ; in no case, however, should one delay more than three weeks.

In a case quite recently under my charge there was a patch of pneumonia centrally localized in the right upper lobe. The temperature remained high, and there gradually developed a narrow band of dullness approximately parallel with the lower border of the lung ; below this dull area breath sounds were normal. A leucocytosis was present. A diagnosis of interlobar empyema was made, and the exploring needle drew off pus. Operation (Lotheissen) was immediately undertaken, and a large empyema was found, situated partly between the upper and middle lobes and partly in front of the middle lobe, connected with an abscess in the lung.

(*b*). When the effusion is putrid.

(*c*). In cases of long-standing pyopneumothorax.

Contra-indications to Thoracotomy.—The operation should not be entertained when acute phthisis coexists, it will only hasten the end. A very low vitality and signs of heart failure are against operation, although cases almost moribund are sometimes rescued. Serious complications in other organs also contra-indicate it. With regard to the relatively rare double empyema opinions are divided. Unverricht considers that in these cases the fluid is always encysted, and can, therefore, be dealt with by double thoracotomy. Chronic pulmonary tubercle is no bar to operation unless it is very extensive.

Risks.—The dangers, during and after thoracotomy, with rib resection, are in the first instance dependent on the disease itself for which the operation is done. When the case is complicated by severe pulmonary disease, such as tuberculosis or gangrene, the risks are relatively great. Thoracotomy without rib resection is attended by many dangers, and has been, for that reason, almost entirely abandoned.

Prognosis. — *Results of operation.* — In many cases, especially in young patients, complete recovery follows. The prognosis is very good in young subjects whose general condition is well maintained; the great majority recover (at least four-fifths) after a comparatively short convalescence, if the operation is done in good time.

Prognosis without operation.—In cases of serous pleurisy the effusion may organize; in some cases bronchiectasis results, and the thorax may be retracted on the affected side. Purulent effusion is very rarely spontaneously absorbed; with the exception of the metapneumonic collections, empyemata rarely discharge into the lung or to the exterior, and should this take place high continued fever usually results, and enfeebles the patient; sometimes metastatic abscesses are formed.

When the exudate is putrid it often causes death, with symptoms of septicæmia. If a purulent exudation makes its way to the exterior, fistulæ form, and discharge persists for a long time; under such conditions waxy disease of the internal organs commonly supervenes.

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PNEUMOTHORAX.

Etiology.—Pneumothorax may result from a wound penetrating the chest wall; it also follows diseases of the lungs in which the pleura is damaged, the most important being tuberculosis, gangrene, and abscess, and, among the less common, bronchiectasis, pulmonary infarct, emphysema, and hydatid. Occasionally it occurs from disease in the alimentary tract encroaching on the pleura, and may also be caused by the rupture of an empyema into the lung.

Pathological Anatomy.—In recent cases the physical signs are often very confusing; in old-standing cases the lung is retracted, the neighbouring organs are displaced, and the pleura is thickened and friable. Pneumothorax is often total, but sometimes only partial, when adhesions prevent its extension. Usually there is a patent communication with the lung, and the condition is spoken of as open pneumothorax; more rarely there is no pulmonary fistula, and the term closed pneumothorax is used. In cases of long standing there is always some fluid in the pleural cavity, either simple or septic and fœtid pus.

Clinical Course.—The condition usually has an acute onset, with pain and intense dyspnœa. On the affected side, the chest bulges, and the intercostal spaces project, while the heart, liver, diaphragm, and sometimes the spleen, are displaced. The percussion note is hyper-resonant, and a metallic note (bell sound) is obtained with the plessimeter. The auscultatory sounds also have a somewhat metallic quality, both the respiratory bruit, and also those

heard when the patient coughs or speaks, but only exceptionally is this noticeable in the case of the heart sounds. The " tinkle " of falling drops is often heard, and sometimes there are sounds resembling those produced in a " hookah." An important phenomenon is the so-called hippocratic succussion, first appearing after the pneumothorax has been present for some days. Sometimes, and in particular in traumatic cases, no breath sounds at all are audible on the affected side. The fluid present is free in the pleural cavity, and its limits, as revealed by percussion dullness, vary according to the patient's attitude ; it occupies whatever for the time being is the most dependent part, and its upper limit is horizontal. When there is a persistent open communication with the lung there is no displacement or retraction of the heart and other structures ; the tympanitic physical signs are usually present in such cases and not infrequently a *bruit de pot felé* is also heard. A pneumothorax in a pleural cavity more or less obliterated by adhesions, is partial ; often under these circumstances there is much deformity from retraction, but sometimes this is wanting. Usually succussion can be elicited when the condition is of long standing. Radiography shows a clear zone corresponding to the pneumothoracic space or spaces.

Diagnosis and Differential Diagnosis.—If the physical signs are well developed there can be no difficulty about the diagnosis. A partial pneumothorax may be mistaken for a cavity in the lung, but in the latter condition the characteristic tympanitic signs are very rarely present, and succussion is hardly ever found. The sudden development of the symptoms, their localization at the base, and the displacement of neighbouring organs, make the diagnosis of pneumothorax certain, for lung cavities of large size are hardly ever present except in the upper lobe, are gradual in development, and are not associated with visceral displacements.

Subphrenic pyopneumothorax is often difficult to distinguish from pneumothorax, but a history of primary abdominal signs pointing to some suppurative lesion in the abdomen will probably be obtainable in the case of the former. Rarely, there may be some difficulty in deciding whether clinical signs resembling pneumothorax are not

due to extreme gastric dilatation, or a diaphragmatic hernia.

INDICATIONS FOR OPERATION.

Operation is undertaken in some cases for the relief of extreme dyspnœa, in others for the cure of the condition itself. If dangerous dyspnœa is present, thoracocentesis is indicated; it is more beneficial to extract fluid than air from the pleural cavity. This vital indication holds for both the curable and incurable cases. No general rules for thoracotomy can be laid down; the decision will depend on the cause of the pneumothorax, the general condition of the patient, and other matters. The following rule of Gerhardt's will, however, cover many cases: "Pyopneumothorax which persists for several days, and is not essentially incurable, should be treated by thoracotomy." The operation is particularly indicated when the condition is secondary to some acute lung disease, such as gangrene and abscess; if it is secondary to tuberculosis of the lung, more or less circumscribed, the operation is also called for when the patient's strength is well sustained, when fever is absent, and there are no signs that the tubercle is of the rapidly progressive type.

Spontaneous rupture of an empyema with resulting pneumothorax almost always necessitates operation, but I have seen one such case recover spontaneously after the lapse of a considerable period.

Contra-indications.—If the fundamental cause of the disease is incurable and extensive, as in such conditions as advanced phthisis, or ulceration and perforation of an œsophageal cancer, thoracotomy is inadvisable; it is also inadvisable in pneumothorax secondary to infarct, because in this condition there are usually present serious circulatory lesions. If it is suspected that the pneumothorax is of a valvular character, aspiration is contra-indicated. Traumatic pneumothorax, following fracture of the ribs, tends to right itself spontaneously, and *no* operation should be done in the early stages.

Risks of operation.—Simple paracentesis may be followed by extensive cutaneous emphysema if the puncture is above the level of the fluid. Thoracotomy, with washing out, is attended with the same risks as in simple empyema;

convulsions, paresis, and other serious symptoms, may occur from embolus. In weak subjects the risks of general anæsthesia are to be considered. Miliary tuberculosis may follow operation on tubercular cases, and this has occurred in my own experience.

Prognosis. — *Without operation.* — Pyopneumothorax following acute pulmonary disease is attended by risk to life from exhaustion and the other conditions produced by chronic suppuration. The prognosis in tubercular cases is very unfavourable, according to West. When pneumothorax supervenes on pulmonary tubercle death occurs in 90 per cent of the cases within a month.

Prognosis of operation.—Thoracotomy is often curative when the causal condition of the pneumothorax is some acute destructive pulmonary lesion. In other conditions, where the lung lesion is of more serious and obstinate type, death often occurs in spite of operation from chronic suppuration or some complication. In Schede's words, "the prognosis of the operation for empyema depends directly upon the prognosis of the affection to which the empyema is due."

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HYDROTHORAX.

Etiology.—Hydrothorax is caused by the conditions which produce general anasarca; it occurs as part of the general œdema associated with cardiac and pulmonary disease, or it may be due to the local effect of mediastinal growths, or to a condition of hydræmia.

Pathological Anatomy.—Either one or both pleural cavities contain a slightly albuminous fluid, but there are no signs of pleural inflammation. The lung is compressed and the diaphragm pushed down as in pleuritic effusion.

Clinical Course.—The physical signs of fluid are present, but there are no signs of an inflammatory process, nor, usually, are neighbouring organs displaced. The area of dullness is largely dependent on the attitude of the patient; the fluid of transudation is apparently more mobile than the fluid of exudation, and its specific gravity is below 1014. Relatively frequently in organic heart failure and heart disease there is an effusion on the right side only, which progresses slowly and is very rebellious to internal medical treatment.

INDICATIONS FOR OPERATION.

Thoracocentesis may be indicated: (1) By the occurrence of general dropsy, and of marked embarrassment in the movements of the diaphragm and heart, which occurs particularly when there is much ascites. The operation may be performed on one or both sides. (2) By the persistence of hydrothorax, when the general dropsy elsewhere has disappeared. If the effusion is allowed to remain in such cases the heart is considerably embarrassed, and fresh disturbances of compensation may develop.

If these indications recur the aspiration will be repeated.

Contra-indications.—It is inadvisable to rely on repeated paracentesis without the administration of digitalis and other cardiac remedies.

Prognosis.—*If paracentesis is withheld* in the first class of cases the sufferings of the patient are greater, and death occurs earlier; in the second class, fresh compensation-defects will arise.

Risks of operation.—Acute pulmonary œdema, sudden serious cardiac insufficiency, and even cardiac paralysis, are accidents which may follow immediately upon aspiration.

Results of operation.—The removal of a hydrothorax is often followed by much improvement in the function of the circulatory system, and remedies previously ineffective may then produce good results.

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TUMOURS OF THE PLEURA.

Pathological Anatomy.—Tumours of the pleura may be primary or secondary. The primary tumours are endotheliomata; they form dense and extensive masses, spreading for the most part on the surface. Secondary tumours usually co-exist with growths in the lungs. Usually there is effusion in the pleural cavity, and this is often hæmorrhagic.

Clinical Course.—The disease is often masked by extensive effusion. This often develops rapidly without fever, and produces much displacement of organs, and if removed by puncture rapidly collects again. Although often hæmorrhagic it may not be so in its early stages, as in a case under my care, in which blood was found present only after the fluid had been drawn off three times. Particles of growth may be found in the fluid, and their discovery has often led to a correct diagnosis. Diagnosis may also be assisted by enlargement of supraclavicular glands, rapid wasting, and the persistence of dullness after puncture in atypical situations. Expectoration of bright red sputum, pointing to growth in the lung, and the rapid development of implantation growth along the puncture track will reveal the true nature of the condition. I have seen such implantation metastases in two cases; in one, a nodule the size of a hazel nut developed within the short space of forty-eight hours after the aspiration.

INDICATIONS FOR OPERATION.

A radical operation is never possible in the case of primary tumours; but thoracocentesis may be done to prolong life. The interval between one aspiration and another should be kept as long as possible, for the fluid often rapidly reaccumulates; and the drawing off of the highly albuminous fluid at short intervals may hasten rather than delay the fatal termination.

Secondary involvement of the pleura by growths of the thoracic wall is no contra-indication to operative treatment; if there is very distressing pain, or symptoms develop which directly threaten life, operation is indicated, even if metastases are already present (Amburger).

Prognosis.—*Dangers of operation.*—The risks are greater

than in dealing with ordinary pleuritic effusions ; it is more frequently followed by hæmorrhage into the pleura, and collapse. If the pleural growth is secondary, and there are general metastases, it is, on the whole, wise to do nothing.

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CHAPTER VIII.

Diseases of the Mediastinum.

Chapter VIII.

DISEASES OF THE MEDIASTINUM.

SUPPURATIVE MEDIASTINITIS.

Etiology.—Hoffmann distinguishes three etiological types: firstly, mediastinitis caused by the spread of inflammatory processes from neighbouring organs; secondly, metastatic abscesses; thirdly, traumatic mediastinitis. Tuberculosis is the most common cause of purulent collections here, less frequently the presence of foreign bodies in the œsophagus or new growths of this channel. In a relatively large number of cases mediastinal suppuration has its origin in the neck or in the buccal cavity or the vertebral column, and makes its way downwards; occasionally it results from the extension of a pulmonary lesion or of a subphrenic abscess. As a metastatic process it is met with in erysipelas and typhoid fever. I have met with two cases in syphilitic subjects.

Pathological Anatomy.—Suppuration appears to occur more frequently in the anterior than the posterior mediastinum. Very large collections may form and may make their way into neighbouring organs, or come to the surface. As a rule the lesions are complex and affect parts other than the mediastinum. The pus is often of a highly septic or putrid type.

Symptoms and Diagnosis.—Mediastinal suppuration must be looked upon as an uncommon lesion; it is almost always attended by fever, but in tubercular cases this may be of very slight degree. Pain, and particularly throbbing pain, is usual, but not always present; in two cases of my own it was entirely absent. There may be tenderness on pressure over the sternum, and the skin here may be red and œdematous. Sometimes a skiagram shows a shadow corresponding to the purulent collection. I have several

times noted dullness in the first and second intercostal spaces. Various symptoms may arise from compression and narrowing of the mediastinal space, the neighbouring organs and channels are all more or less affected, but in varying degrees. In two of my cases the laryngoscope showed compression of the trachea, and the cause of this was cleared up when a large collection of pus ruptured into the trachea, the mediastinal symptoms then subsiding. Other symptoms that may be met with are paralysis of the recurrent laryngeals, œsophageal symptoms, cardiac embarrassment, engorgement of the cervical veins. In a considerable proportion of cases, both tubercular and non-tubercular, the pus finds its way to the surface through an intercostal space. In many cases the gravity of the primary lesion is such that death results; occasionally recovery follows discharge of the pus, or a chronic lesion may eventuate.

INDICATIONS FOR OPERATION.

As soon as a diagnosis of suppurative mediastinitis has been made, the focus should be opened, provided it is accessible, and the patient's general condition admits of operation. The diagnosis is most clear when there is a lesion of the bones adjacent to the mediastinum (sternum, vertebræ), or when the presence of a foreign body in the œsophagus is associated with fever and signs of compression of the mediastinal organs, but such indications are present in only a small proportion of cases. In most, the indication leading to operation will be the appearance of a circumscribed œdema on some part of the thoracic wall, or the discovery of an abscess which has extended downwards, pointing to some septic lesion at a higher level; or the discovery of carious bone or of a foreign body in the gullet may lead to a true understanding of the case. Operation consists in opening the mediastinum, either by trephining the sternum or by resection of ribs.

Contra-indications.—No operation should be done if the exact situation of the pus is not known, if the mediastinal abscess is only one of many metastatic abscesses, or if the suppuration is due to some necessarily fatal lesion.

Prognosis.—*Results of operation.*—The results of operation are uncertain. In one case recently under my care the

immediate result was good, but the suppurative process steadily extended.

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MEDIASTINAL TUMOURS.

PATHOLOGICAL ANATOMY.—Tumours of the mediastinum are either primary or secondary, the former alone being suitable for operative treatment. Primary growths may be simple or malignant. The lymphosarcomata are often very extensive and may occupy the whole mediastinal space and envelop the trachea and vessels. The sarcomata early infiltrate the trachea or the bronchi. Carcinomata are usually secondary. The simple growths are less common than the malignant; they occur in the following order of frequency: endothoracic goitre, dermoid cyst, fibroma, lipoma, hydatid cyst. An endothoracic goitrous tumour may be retrosternal, and may compress the innominate vein and the trachea, or it may lie behind the clavicle and extend laterally into the thorax and compress the lung; often it is connected with the thyroid gland by a pedicle of varying size. Occasionally two such growths have been met with, both connected with the thyroid gland. Dermoid cysts are always situated in the upper half of the anterior mediastinum, and almost always extend to one side of the thorax only. They may reach large dimensions, usually project into the neck or into an intercostal space, and may rupture into a bronchus or into the pericardium or a large vessel; they often form adhesions to surrounding structures.

CLINICAL COURSE.—The symptoms caused by mediastinal tumours are very variable. In addition to the general symptoms only produced by malignant growths, there is a whole series of important local signs. Dilatation of the veins of the anterior thoracic wall is especially common, and is sometimes associated with œdema. The tumour is

sometimes palpable from the neck; in intrathoracic goitre it is almost always possible to feel a prolongation from the thyroid passing downwards behind the sternum or the clavicle. Dullness is usually found in the first intercostal space, and signs of pressure on the trachea and bronchi and the other mediastinal structures, œsophagus, nerve trunks, etc. Glandular swellings in the neck are usually only present when the growth is malignant. Pleural effusion is often an associated sign; even without this the thoracic wall is often bulged, particularly by dermoid growths. When a dermoid cyst ruptures into a bronchus, hair is coughed up by the patient, if it ruptures externally it discharges an oily, viscous fluid; such a fistula often heals and then breaks down again.

Diagnosis.—It is of the greatest importance that an early diagnosis of simple mediastinal growths should be made. They are distinguished by their slow development and by the absence of any sudden onset of compression symptoms. The presence of a goitre in the neck will at once indicate the nature of a growth in the upper anterior mediastinum. Dermoid cysts may sometimes be diagnosed by exploratory puncture, as in a case recently seen in a clinic in Vienna (Türk); in other cases, the discharge from a recently established fistula, or the coughing up of hair associated with signs of mediastinal tumour in a young individual, has established the diagnosis. In one case a skiagram revealed the true nature of such a tumour.

The greatest difficulty lies in differentiating between tumours and aneurysm, encapsuled pleural effusion, or empyema. Dermoid cysts may be actually associated with the latter. Sometimes a bronchiectasis which ruptures into a bronchus may cause difficulty in diagnosis.

INDICATIONS FOR OPERATION.

If a simple tumour of the anterior mediastinum is definitely diagnosed, operation for its removal should be undertaken, unless the patient is very weak or the tumour is of very large dimensions. Very large growths have, however, been successfully removed; for example, a dermoid cyst of great size was successfully dealt with by v. Eiselberg and Türk.

Contra-indications.—In cases of intrathoracic goitre or

other growths, when the symptoms are not urgent, operation should not be undertaken until internal treatment with thyroid extract has been tried. In one case of a most severe type I have observed almost complete disappearance of all symptoms under this treatment. Antisyphilitic treatment should also be tried when there are such signs as glandular swellings. When cachexia, glandular enlargement, and the presence of other growths point to the malignant character of a mediastinal growth, operation would be useless.

PROGNOSIS.—*Risks and results of operation.*—The risks of a radical operation must necessarily be great; but many successful operations on simple growths have been recorded. In many cases of dermoid cyst where extensive secondary adhesions have formed, only incision and drainage is to be recommended. This procedure is much less dangerous than a radical operation, but less likely to be successful in curing the condition.

If no operation be done, a tumour, although of simple character, will cause death by its mechanical effects. All cases of dermoid cyst left alone have died either directly from the growth, or from some complication (Ekehorn). There are cases, however, in which the presence of the tumour is compatible with a comparatively long life. I am acquainted with a patient who has had tracheal stenosis from a mediastinal growth for seven years, yet he is still in good condition, and the large growth produces relatively few local symptoms.

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CHAPTER IX.

Diseases of the Heart and Blood-Vessels.

Chapter IX.

DISEASES OF THE HEART AND BLOOD-VESSELS.

PERICARDITIS.

Etiology.—Pericarditis is most frequently caused by acute rheumatism, tuberculosis, and pleuropneumonia; next in order of frequency come septicæmia, scarlatina, acute periostitis, and the dyscrasic affections, particularly scurvy, hæmophilia, carcinoma, and Bright's disease. It also appears that a primary infection of the pericardium by way of the blood stream may occur, a form to which the term idiopathic pericarditis is applied. The pericardium also may be involved in contiguous septic processes, bronchiectasis, pulmonary gangrene, subphrenic abscess, œsophageal cancer, empyema, mediastinitis, etc.

Pathological Anatomy.—The inflammatory process may be adhesive or exudative. Exudation may be serous, hæmorrhagic, purulent, or septic. The fluid collects earliest and in greatest amount about the great vessels and in the angle between heart and liver; when the pericardium becomes distended, fluid collects behind the heart. The amount may reach 1500 cc. or even 2000 cc. The heart muscle is usually involved in the inflammatory process; when healing takes place the pericardial space is often more or less obliterated.

Clinical Course.—The affection is characterized by the appearance of friction sounds which are not completely isochronous with the heart phases, are entirely independent of respiration, and are increased in intensity when the stethoscope is pressed on the chest wall. The exudation first fills the cardio-hepatic angle and elevates the base; later the dullness extends to the left beyond the apex point, and assumes a roughly triangular shape with a broad base; it extends as the condition progresses. To the left, behind and below, the percussion note is usually tympanitic in the

early stages and the breath sounds are indistinct. Very often a pleuritic inflammation is associated with the pericarditis. The veins of the neck are usually distended ; fever is usual, but not constant ; when the exudate is large the pulse is small and irregular.

Pericardial effusion takes weeks to absorb, and when large in amount often causes death. The prognosis of purulent effusion is bad even when it is small in quantity ; the "rheumatic" cases are the most favourable.

Differential diagnosis.—Pericarditis externa is differentiated by the fact that the friction is influenced by the breath sounds. It is often difficult to distinguish pericardial bruits from endocardial when the right ventricle is dilated. The character of the "rub," its definite localization at a certain spot, the fact that it does not absolutely correspond with the cardiac phases, and the increased distinctness when the stethoscope is pressed on the thoracic wall, will clear up the diagnosis. In doubtful cases, according to Romberg, the most reliable signs are the gradual increase in the area of dullness and the remarkable correspondence of relative and absolute dullness.

INDICATIONS FOR OPERATION.

When the heart begins to fail from the pressure of a large pericardial effusion, puncture of the pericardial sac is absolutely indicated. Puncture is also indicated when a large effusion persists in spite of prolonged medical treatment, and is gradually enfeebling the patient. When pus is present in the pericardium, the latter must always be freely opened unless the general condition is desperately bad. An exploratory puncture will demonstrate the character of the fluid. An effusion is probably purulent when there is pus in the pleura and inflammatory œdema of the chest wall.

Contra-indications.—Operation is only contra-indicated by the presence of advanced disease elsewhere, such as pronounced valvular lesions, new growths, phthisis, Bright's disease.

Risks of operation.—The risks are considerable, because the heart muscle is usually affected. The right mammary artery and even the right ventricle have been wounded. Obliteration of the pericardial sac often follows operation, and is a serious lesion.

PROGNOSIS.—In many desperate cases recovery has been brought about by operation; v. Schrötter records 47 recoveries and 53 deaths in 100 cases,—but it should be remarked that only the most serious cases have hitherto been submitted to operative treatment.

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ANEURYSM.

ETIOLOGY.—Arteriosclerosis is the most important cause of aneurysm; hence its relative rarity in young subjects. All the conditions which produce atheroma :—alcoholism, laborious occupations, etc., favour the development of aneurysm. Other factors are syphilis and trauma—and the latter may be either single and severe, or slight and repeated. Embolism of the smaller arteries may produce "embolic" aneurysm, and "erosion" aneurysms occur from erosion of vessels from the outside.

PATHOLOGICAL ANATOMY.—The term aneurysm is applied only to circumscribed arterial dilatation; diffuse dilatation such as that met with in aortic incompetence and atheroma are not so designated. In true aneurysm all the walls of the vessel participate in the formation of the sac, in false aneurysm the sac is formed by some part of the vessel wall along with surrounding structures. Aortic dilatations may be fusiform or saccular. In fusiform aneurysms coagulation and thrombus formation is rare; in the saccular aneurysms it is common, but organization of thrombus is very rare. The sac may communicate with the artery by a large or a small aperture, it is often extremely adherent to its surroundings, and erodes any bony structures with which it is in contact.

Aneurysms of the aorta constitute about a half of all aneurysms in man; they may involve secondarily any structure in the mediastinum, either by simple compression or by the formation of adhesions in addition; ribs, clavicle,

or vertebræ may be eroded. In large aneurysms in place of a single sac there may be secondary or tertiary protrusions communicating with the primary sac by apertures of greater or less size. When an aortic aneurysm penetrates the thoracic wall this almost always takes place through the formation of a secondary protrusion from a saccular aneurysm—a fact of much importance from the point of view of surgical treatment. In the neighbourhood of an aneurysm there is almost always great overgrowth of fibrous tissue embracing the wall; this assists in preventing perforation in the early stages, but is not equal to preventing it later.

Rupture may take place externally or into a hollow organ or a serous cavity. Rupture into an adjacent vein produces the so-called varicose aneurysm; a dissecting aneurysm is one formed in the vessel wall itself by rupture of the inner coat. The vessels originating near the aneurysm undergo changes: traction may make their orifices slit-like, thrombosis and endarteritis may in part obstruct them, or they may be directly compressed. Genuine spontaneous healing of aneurysm is very uncommon.

Clinical Course.—The clinical signs and symptoms of aneurysm are various.

Aneurysm of the ascending aorta and arch, as all other vascular tumours, produce subjective and objective phenomena. Pain, often of the character of angina pectoris, is the chief subjective sign, and objectively there are found displacement and compression of neighbouring organs and the development of a pulsating tumour.

An aneurysm confined to the thorax is often discovered by chance, either from a radiograph or on percussing the chest, or in the course of a laryngoscopic examination. Marked accentuation of the first or second sounds over the course of the aorta, or bruits superadded to these in the same region, will raise the suspicion of aneurysm. Dullness in the first and second intercostal spaces close to the sternum, pronounced pulsation in the suprasternal region, pulsatile elevation of the upper part of the sternum, and pulsation to the right of the manubrium, are definite signs of aneurysm. Associated with or independent of these signs there may be distinct difference in distension of the carotids or subclavians, much more rarely, a delay in the right radial as compared

with the left, or vice versa. Paralysis of the left recurrent laryngeal nerve and corresponding vocal cord is frequent, also localized pulsatile elevation of the tracheal wall, left bronchial stenosis, a laryngeal tug, and more or less marked œsophageal obstruction. When the vertebræ are eroded there is local tenderness on pressure, and rigidity, with unilateral or bilateral intercostal neuralgia.

If the sternum or the ribs are eroded, the aneurysm may present as a pulsatile and expansile hemispherical tumour. When a saccular aneurysm of the arch causes bronchial stenosis there is stridor and interference with the respiratory cycle on the left side; an aneurysm situated here also often causes left sympathetic paralysis, but venous compression is rare even in the case of large tumours.

Aneurysms of the descending thoracic aorta are comparatively rare; they may present all the above-named symptoms, but more often are only revealed by the presence of a circumscribed dullness. Sometimes aneurysms are very elongated in outline. I have seen a case in which an aneurysm of the arch extended into the neck from the origin of the carotid to the upper third of the trachea; death took place from rupture into the trachea.

Aneurysm of the abdominal aorta is very uncommon; it is revealed by palpation and auscultation.

Diagnosis and Differential Diagnosis.—Aneurysms suitable for operation cannot be confounded with many other affections. Simple atheroma of the aorta does not erode and push forward the sternum. Very vascular new growths sometimes give rise to considerable difficulties. Venous distension over the thoracic wall points to new growth, as do also glandular enlargements, the presence of tumours elsewhere, marked cachexia, and soft systolic and diastolic bruits over the swelling. The absence of expansile pulsation is against aneurysm; abscesses as well as new growths may have pulsation communicated from the aorta, and are differentiated from aneurysm by the same sign. A pointing pulsatile empyema is to be distinguished by the history, the position of the heart, and by exploratory puncture.

INDICATIONS FOR OPERATION.

Different operative measures have been employed, and indications vary according to their severity. Complete or

practically complete recovery occurs in rare cases by organization of clot. Such an event occurs almost exclusively in saccular aneurysms communicating with the vessel by a small aperture ; in fusiform aneurysms it is exceedingly unusual. If an aneurysmal sac has developed secondary extensions, as is almost always the case in those penetrating towards the surface of the chest, the prognosis is unfavourable, but even in these some improvement may be brought about. When the sufferings of the patient are great, the possibility of improving or relieving him of some of his symptoms by surgical intervention is well worth consideration.

Operation is therefore in a measure indicated when the physical signs point to the presence of a saccular aortic aneurysm with a narrow neck ; a skiagram may be of great assistance. There are, however, other points to be considered : the aneurysm should not be deep seated, but should underlie the thoracic wall or extend beyond the limits of the chest above* ; the condition of the heart must be good without dilatation, and such serious complications as extensive atheroma must be absent. Medical treatment should always be first tried, and operation will only be considered when this has failed. The operation of Brasdor, ligature of the common carotid, or subclavian, or both, does not require that an aneurysm should be saccular and possess a narrow neck, but may be employed in the absence of these conditions. Acupuncture, galvanopuncture, and the introduction of foreign material into the sac have the same general indications : the aneurysm should present near the surface, the general state of health must be satisfactory, other vascular changes must not be of an advanced type, and the aneurysm should be connected with the main vessel by a more or less narrow neck. The subjective condition of the patient should have considerable weight attached to it ; if his sufferings are extreme, operation may be justifiable even though its chances of success seem small. Subcutaneous injections of gelatin may be employed whatever the site and size of an aneurysm, but according to Sorgo it

* Many writers do not consider this condition necessary, and would recommend operation whether the aneurysm protrudes from the thorax or not.

is only in the saccular form that there is a prospect of success.

Contra-indications.—These have been already generally indicated. When the sac wall is very thin Brasdor's operation is contra-indicated for fear of rupture. When there are valvular lesions, or when the aneurysm is of great size, no operation will be done. When the trachea is compressed, tracheotomy is not advisable, because the pressure of the tube is very likely to lead to rupture of the aneurysm into the trachea. I have seen this happen twice a few days after tracheotomy. In patients with renal disease gelatin injections are contra-indicated.

Risks of operation in internal aneurysm. In acupuncture, galvanopuncture, and the introduction of foreign matter into the sac, experience has shown that the danger of profuse hæmorrhage from the wound is not great ; but when these measures are employed, and the communication with the aorta is large, emboli may be carried into the arterial system. The dangers of Brasdor's operation are those associated with carotid ligature and subclavian ligature; that is to say, cerebral anæmia and softening on the one hand and gangrene of the arm on the other. Extensive thrombosis of peripheral vessels may follow gelatin injections, and tetanus is a risk if the most careful precautions are not taken.

Prognosis.—The prospect of cure is small whatever operative measures are employed, but long-lasting improvement may be produced. In a case reported by Stewart which was treated by galvanopuncture, improvement lasted three years; in a case of Bäumler's it lasted two years after acupuncture following Brasdor's operation. Cure has been brought about in a relatively large number of cases by Brasdor's operation, and the prognosis is particularly good in innominate aneurysms. In many cases, however, operation has no influence on the progress of the condition.

When no operation is undertaken, recovery occurs very rarely spontaneously or under medical treatment, but by the latter means and dietetic regulation progress may be checked and the condition improved. Death occurs in the large majority of cases from rupture of the sac or other complication.

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HYDROPS ANASARCA.

Indications for Operative Treatment.—The anasarca due to cardiac and renal disease is alone in question; for the œdema of cachexia no operation is justified. There is some difference of opinion as to the best time for operative treatment; some employ it only when all other therapeutic procedures have failed, others advise it early. It is well to follow the indications formulated by Romberg: when diuretic stimulation fails and diaphoresis is impracticable or ineffective, and the condition of the patient calls for urgent relief from the œdema, puncture of the skin should be employed. This is a vital indication, and apart from this the operation is advisable when the anasarca is great and distressing to the patient, and is unrelieved by drugs, particularly if the general condition is good. Incision may take the place of puncture if the state of the skin is not favourable for the latter.

Contra-indications.—Erysipelas, phlebitis, and other extensive inflammatory processes of the lower limbs contra-indicate operative treatment, and it is the same in my experience when the legs are in a condition of elephantiasis, with much thickening of the skin and overgrowth of connective tissue beneath—in such condition only very small quantities of fluid can be drawn off. If the patient is stupid, unreasonable, and unruly, the risks are considerable.

Prognosis.—*Risks of operation.*—If the patient is difficult to manage, and if drainage is kept up for a long time, there are risks of infection. If large incisions are made and the fluid escapes very rapidly, the drainage may be, and often

has been, followed by collapse and sudden death. I have seen sudden death occur several times on the second, third, or fourth day after the rapid drawing off of the fluid, and after a period of comparative well-being, and I consider that at the most four litres *pro die* should be removed by puncture or scarification. It is also necessary to bear in mind that scarification and puncture, often repeated, result in so considerable a loss of albumin that amyloid changes in the viscera may be induced thereby.

Results.—Operative treatment often saves life; the heart is considerably relieved, and the circulatory disturbance may then right itself. The subjective condition of the patient often improves greatly in the course of a few hours; the pains in the bones and the dyspnœa disappear. Usually puncture promotes diuresis, and diuretics and cardiac stimulants are more effective after than before it. In a case of mine of mitral insufficiency and stenosis, with extreme and universal anasarca, after puncture of the ascites and drainage of the skin of the legs for some days, the œdema entirely disappeared, and remained absent absolutely for three years.

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CHAPTER X.

The Indications for Venesection.

Chapter X.

THE INDICATIONS FOR VENESECTION.

Venesection, once so common and then abandoned, is again employed to-day under certain circumstances. The two fundamental indications are the removal of toxic products and the relief of the circulation; it is no longer done on "antiphlogistic" principles. The most generally accepted indications are as follows:—

INTOXICATIONS.

In the intoxications venesection is an important therapeutic agent, in particular in the cases of poisons which concentrate themselves in the blood and directly affect it. As much as 300–400 cc. may be drawn off from patients suffering from the effects of the inhalation of poisonous gases: sulphuretted hydrogen, coal gas, carbonic oxide, hydrocyanic acid, and anæsthetic nitrous oxide. The risks of the blood-letting are minimal compared with those to which such patients are exposed, particularly if followed immediately by transfusion of saline; the risks are greatest in anæmic and least in full-blooded individuals.

INSOLATION.

In insolation bleeding is indicated when internal medication fails and convulsions make their appearance. Of twenty cases thus treated Gérand lost none.

URÆMIA.

In uræmia bleeding should always be tried; when attacks come on suddenly and other methods fail, life has often been saved by this means. The risk is comparatively insignificant. In the chronic forms of uræmia, in which the

patient may remain for weeks in a somnolent condition, interrupted by attacks of dyspnœa and vomiting, bleeding may be of great use on the onset of convulsions or coma. According to Strubell the abstraction of blood and transfusion of saline has sometimes saved life under these circumstances. This form of chronic uræmia is usually associated with idiopathic or secondary interstitial nephritis. Bleeding is also of great value in uræmia due to acute and subacute nephritis ; according to Leube it lessens the gravity, the risks, and the length of the attacks.

ECLAMPSIA.

According to Zweifel copious bleeding up to 500 cc. is advisable in this affection. It is valuable as a preliminary to the production of artificial labour, and the combination of these two procedures has given results superior to all other methods of treatment, deep cervical incisions and the like. It is absolutely indicated when eclampsia comes on during labour, or persists after natural or artificial delivery.

PNEUMONIA.

Bleeding is only indicated in pneumonia in the presence of established or commencing pulmonary œdema associated with commencing heart failure. Feebleness of the second pulmonary sound indicates the onset of heart failure ; bleeding often gives such relief that the patient's strength is thereby enabled to hold out until the crisis. Under these circumstances the indication is absolute unless some other dangerous lesion is present elsewhere or the enfeeblement of the patient is already extreme. I have often seen venesection save life in pneumonia, especially in patients with some heart lesion.

CIRCULATORY DISTURBANCE.

In circulatory disturbance due to valvular or myocardial lesions the indications for venesection are not definitely determined. According to H. Pavy it is indicated in commencing heart failure, dilatation of the right ventricle with progressive dyspnœa, commencing œdema of the bases,

and diminished pulmonary second sound. It is indicated early, according to Strubell, in bronchitis of a severe type, and pneumonia in alcoholic subjects. In chronic heart disease its effect is transient, and in several patients thus affected bleeding has been followed by thrombosis, for example in the basilar artery.

CHLOROSIS.

Venesection has been employed in chlorosis, but is not to be recommended.

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CHAPTER XI.

Diseases of the Mouth and Pharynx.

Chapter XI.

DISEASES OF THE MOUTH AND PHARYNX.

HYPERTROPHY OF THE TONSILS.

Etiology.—There often appears to be some hereditary tendency to this condition. It may follow repeated attacks of tonsillitis, and is also associated with the so-called scrofulous condition.

Pathological Anatomy.—Tonsillar hypertrophy is usually bilateral, and often so considerable as to markedly obstruct the pharyngeal channel. The tonsils are sometimes soft, sometimes hard, and often fissured. The crypts often contain calculi, plugs of mucus, or pus, the latter often only revealed on squeezing the tonsil, and associated with thrombosis of the neighbouring veins. I have seen several cases of fatal septicæmia due to such purulent collections only revealed by a specially careful examination at autopsy.

Clinical Signs.—Tonsillar hypertrophy favours recurrent attacks of inflammatory mischief, attacks which it is now well recognized are far from being harmless. When hypertrophy is marked, respiration is prejudiced, especially during sleep, and there are difficulties of phonation and deglutition. Pharyngeal catarrh often co-exists, and the Eustachian tubes and middle ear are then frequently affected. The pharyngeal adenoid tissue is also very often hypertrophied.

INDICATIONS FOR TONSILLOTOMY.

Hypertrophied tonsils should be removed if they are giving rise to the least trouble. The operation is therefore indicated when the tonsils are subject to repeated attacks of inflammation, when there are disturbances of phonation or deglutition, when there are any signs of middle-ear trouble or deafness, or when sleep is disturbed and restless.

Contra-indications.—Hæmophilia and leukæmia are the only contra-indications.

Prognosis.—*Risks of operation.*—These are minimal. Occasionally troublesome hæmorrhage has occurred from the tonsillar branch of the pterygopalatine (O. Zuckerkandl). In one case of unrecognized hæmophilia under my care the operation caused dangerous hæmorrhage.

If no operation is done the tendency to tonsillitis will remain, with the risks of middle-ear disease, pharyngitis, extensive suppuration, and septicæmia.

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SEPTIC PHARYNGITIS.

Etiology.—This affection is frequently due to the streptococcus, and may be secondary to infections elsewhere in the mouth, for example in the tonsils and the teeth. It is common in diphtheria and scarlatina.

Pathological Anatomy.—The inflammatory process affects the connective tissue between the tonsils and the soft palate, or the substance of the tonsils themselves. As a rule the process goes on to suppuration; sometimes it extends widely in the connective tissue of the neighbourhood, and may occasion an intense phlegmonous inflammation of the floor of the mouth and the pharynx, with marked collateral œdema; this sometimes involves the entrance to the larynx, and in fatal cases this is the cause of death.

Clinical Course.—There is usually high fever, and much pain is complained of, particularly on swallowing and opening the mouth. Examination shows marked swelling and dusky red coloration of the soft palate (usually more intense on one side), of the anterior pillars, and often of the tonsils themselves; the surrounding parts are œdematous, particularly the uvula and faucial pillars, more rarely the laryngeal entrance. After some days suppuration occurs; this is first deeply situated, and later comes to the surface.

Usually after about a week the pus escapes ; in a relatively small number of cases, however, the process goes on to an extensive phlegmonous inflammation of the floor of the mouth, the so-called Angina Ludovici, and this may produce a fatal acute œdema of the glottis.

INDICATIONS FOR OPERATION.

As soon as pus is suspected incisions should be made, whether the collection appears to be superficial or deep. Incision is therefore called for when the signs and symptoms above described have been present for several days ; if the pain is very intense, early deep incision is advisable ; in other cases it is well to wait until an abscess has definitely developed (Störk recommends that one should always wait until fluctuation is discovered) ; certainly, at whatever stage fluctuation is found an incision will at once be made.

It may be said that no contra-indications exist.

Prognosis.—*Results of incision.*—The patient is at once relieved, and the inflammation subsides. If pus is not found at the time of incision, it may be expected that it will come to the surface and escape through the incision in the course of a few hours or days. There is no risk when the incision is made at the right spot, that is to say in the centre of the space between the uvula and the crown of the upper wisdom tooth.

If no incision is made, the symptoms may persist for a considerable time, and sometimes as a consequence there occur œdema of the glottis, Ludwig's angina, or extensive abscess burrowing. Such an abscess may even extend into the mediastinum.

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RETROPHARYNGEAL ABSCESS AND RETROPHARYNGEAL CELLULITIS.

Etiology.—In young children the most frequent cause of retropharyngeal abscess is suppuration of the two

prevertebral lymphatic glands, which are constantly present in front of the second and third cervical vertebræ; it is secondary in these cases to inflammatory affections of the pharynx. The other common cause is a tuberculosis of the vertebral bodies. I have seen two cases in which the primary affection was a syphilitic lesion of the cervical spine, but this is very rare. Sometimes these inflammatory processes are due to some general infection, or may follow trauma, in particular cauterization, of the posterior wall of the pharynx. Occasionally a retropharyngeal abscess is secondary to a chronic otitis media.

Clinical Signs.—Retropharyngeal abscess produces a series of characteristic symptoms. The posterior pharyngeal wall is swollen, and fluctuation can be made out; swallowing and expectoration are painful and difficult; when the condition is well established no solid food can be swallowed, and fluids also cause difficulty, and tend to return through the nose or the mouth. Speech is guttural, as though the patient had his mouth full of food, and breathing is difficult and snoring, particularly with the head inclined forwards. Asphyxial attacks sometimes come on when the patient is lying down. In acute abscesses there is often high fever; in the chronic form it may be absent. Acute cellulitis may cause pronounced prostration and symptoms of septic intoxication. There are often enlarged and tender glands below the jaw, and œdema about the laryngeal inlet.

Differential Diagnosis.—The presence of fluctuation differentiates abscess from tumour, simple lymphadenitis, and adenoids.

INDICATIONS FOR OPERATION.

As soon as abscess is definitely diagnosed it should be incised. It should be opened in the neck when it is of very large size, when it is due to tubercular vertebral disease or to the presence of a foreign body, and when there is severe pharyngeal cellulitis. The common retropharyngeal abscess should be opened from the mouth when the diagnosis is clear. If no fluctuating spot can be found, if the respiration is very embarrassed, or if there is commencing œdema glottidis, tracheotomy is indicated. When suppuration is definitely made out there are no contra-indications to operation.

PROGNOSIS.—*Risks of operation.*—If a large quantity of pus enter the larynx, asphyxia may occur or pneumonia may follow.

If no operation is done, death may occur from asphyxia, the abscess may make its way into the mediastinum, or septicæmia may supervene. In Bokai's statistics 11 out of 144 cases of retropharyngeal abscess died.

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CHAPTER XII.

Diseases of the Œsophagus.

Chapter XII.

DISEASES OF THE ŒSOPHAGUS.

FUSIFORM DILATATION OF THE ŒSOPHAGUS.

Etiology.—In one class of case spasm of the cardiac orifice is the primary cause; in a second class atony and dilatation of the œsophagus is the primary lesion, followed by spasm of the cardia. In both classes the time of onset is usually between the 20th and 40th years. It is usually an acquired condition, and equally common in men and women.

Pathological Anatomy.—The dilatation begins usually just below the level of the larynx, increases throughout the middle and lower thirds, sometimes to enormous dimensions (in Rokitansky's case to the size of a man's forearm), and then reaches normal dimensions again at about the lower 1–2 cm. The size of the dilatation may be such that the œsophagus will hold as much as 1500 cc. The cardiac orifice is usually free from cicatricial stenosis, but there is often local hypertrophy of the wall here.

Symptoms.—The symptoms are chiefly those of œsophageal stenosis. If food and fluids cannot be got into the stomach they are regurgitated without any actual vomiting. Rumination is common. Examination with the stomach tube gives most important information; when the tube is in the œsophagus it brings up quantities of altered food material free from hydrochloric acid or pepsin; when pushed further on into the stomach, which often necessitates the overcoming of some resistance, food material is siphoned up containing both these substances, provided the condition of the stomach is healthy. Such an observation demonstrates the presence of a cavity above the cardia. The same may be demonstrated by passing one tube into the stomach and a second into the œsophagus, and introducing some

colouring matter through the latter; the coloured fluid comes through the œsophageal but not through the stomach tube.

Diagnosis and Differential Diagnosis.—The symptoms just mentioned may also be caused by an œsophageal diverticulum situated at a low level. Leube's sound will often settle the question. If this passes into the stomach without difficulty the case is probably one of concentric dilatation. The second deglutition sound which is heard over the cardiac orifice is altered in cases of fusiform dilatation; that is to say, it may be postponed several minutes after the act of swallowing. Sometimes a radiograph gives useful information.

INDICATIONS FOR OPERATION.

Hitherto gastrostomy is the only operative procedure which has been done in these cases, and then only as a last resource when the patient threatens to die of starvation, that is to say, is in an advanced stage of the condition. Rumpel has proposed direct operative treatment, but the suggestion has not been followed.

Prognosis.—Gradual increase is the rule in this condition, and death may follow from starvation. In many cases life may be prolonged without operation for ten years or more, so that vitally the prognosis is not entirely unfavourable.

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DIVERTICULUM OF THE ŒSOPHAGUS.

Etiology.—There are two types of this condition: the pressure diverticulum and the traction diverticulum. The former is probably due primarily to some congenital anomaly of the nature of a defect in the lower part of the pharyngeal wall, which yields when some traumatic influence is brought to bear on it. The traction diverticula are produced by adhesions following some inflammatory affection in the parts surrounding the œsophagus, as, for example, lymphadenitis, pleurisy, pericarditis, vertebral disease, etc.

Pathological Anatomy.—The traction diverticula are often situated at the level of the tracheal bifurcation ; they are small, and clinically of little importance. Pressure diverticula may be situated high up or in the lower part. The pharyngo-œsophageal form has its origin in some weak spot in the muscular coat of the pharynx, usually about the level of the cricoid cartilage, and sometimes communicates with the pharynx by quite a small opening. It is sacciform in shape, and when full may greatly compress the œsophagus, by the side of which it lies. It may reach the size of a man's fist ; in one of my cases the capacity was a quarter of a litre. The deep diverticula may be equally large and originate in the anterior wall near the tracheal bifurcation. These diverticula may produce an inflammatory reaction around them, and become firmly adherent to other structures; the trachea as well as the œsophagus may be compressed. The pressure diverticula have a lining of mucous membrane.

Symptoms.—The traction diverticula do not produce any symptoms by which they can be recognized during life. The pressure or " Zenker's " diverticula give rise at the beginning to slight difficulty in swallowing, irritation in the throat, and expectoration. Vomiting after a meal is common. In the later stages, when the condition has been present for some years, the difficulties in swallowing increase, the sac fills at the beginning of a meal, and the food material remains there and decomposes. By traction and direct pressure the œsophagus becomes much narrowed. After a varying period the contents are vomited ; they contain no free hydrochloric acid, but sometimes inverted starch ; they are undigested and mixed with a large amount of mucus. In about a third of the cases a soft, fluctuating swelling is to be found in one or both supraclavicular regions, and over this bruits can be made out. There is often excessive fœtor of the breath. A sign of much importance is the gradual displacement downwards of the site of compression, taking place slowly during the course of some years. Examination with the sound and skiagraphy may both be of much assistance in forming a diagnosis. The affection is one of old age and eminently chronic ; it may cause extreme emaciation.

In a case recently under my own observation a difficulty in swallowing gradually developed. The sound was arrested

at a point 28 cm. from the teeth; there was frequent vomiting of decomposed food material, and lavage showed that the sac was capable of containing about a quarter of a litre. Lotheissen was able to see the entrance to the sac and guide the œsophageal sound past it. With the X-rays the sac was well seen when filled with bismuth, and a U-shaped lead sound introduced into it was also demonstrated. It had reached the thoracic cavity and moved with respiration; the mucous membrane was ulcerated in patches, and there was an enormous production of mucus. Vomiting was painless and occurred on coughing. The patient could only be fed by enemata, and a gastrostomy was done at a time when there were signs of commencing pneumonia. Death took place some days later, and the large diverticulum was demonstrated post mortem behind the œsophagus, with commencing carcinoma at its entrance.

The deep-seated diverticula often give rise to stenosis phenomena and pain only when the sac is filled during the meal; but the symptoms may be in general very similar to those of the diverticula above, and the physical signs are the same. For radiographic demonstration the patient is fed with bismuth and mashed potato.

The diagnosis will be based on the history, the presence of the tumour in the neck, the examination with the sound, and the age of the patient. The chronic course of the affection will distinguish it from carcinoma, and the history from cicatricial stenosis.

INDICATIONS FOR OPERATION.

If there is impermeable stenosis, gastrostomy may be indicated, and from the point of view of the life of the patient it may be said to be as successful as radical extirpation. It is particularly indicated in debilitated individuals who first come under observation at a late stage, also in patients who are not favourable subjects for a general anæsthetic, and thirdly, when stenosis is so marked that radical operation promises little success. It may also be undertaken with a view to retrograde dilatation with sounds.

Extirpation of the diverticulum may be undertaken when it is situated high up, whatever its size, and when it is interfering with feeding and causing stenosis. It should

be done at as early a stage as possible. It is not free from risk, and will therefore not be advisable in advanced debility. Gastrostomy is practically free from risk; total extirpation is comparatively dangerous.

If no operation is undertaken, the condition is chronically progressive, and will cause a very distressing death from inanition.

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ŒSOPHAGEAL STENOSIS: CICATRICIAL AND CARCINOMATOUS.

ETIOLOGY.—Cicatricial stenosis is usually due to scald or the burn of some corrosive, more rarely to wound or other trauma. Occasionally it is due to the pressure and adhesion of lymphatic glands or to the contraction of an ulcer caused by a perforating diverticulum.

PATHOLOGICAL ANATOMY.—The stenoses caused by corrosion tend to occur at the natural isthmuses of the œsophagus, that is to say, at the level of the cricoid cartilage, and at the cardia or immediately above it. Such strictures are usually annular; if their extent is more than from 5 to 10 cm. they are spoken of as cylindrical; sometimes the tube dilates above, and this dilatation may show ulceration, and may even go on to perforation.

Carcinoma is almost always primary; very rarely a growth of the cardiac end of the stomach spreads to the œsophagus; the common site is the level of the tracheal bifurcation. Sometimes the growth is scirrhous and produces pronounced stenosis, sometimes it is exuberant and cauliflower-like. Perforation into the lung, pericardium, and other organs is common, and the mediastinum and vertebral column are encroached upon.

SYMPTOMS.—Cicatricial stenosis causes difficulties of deglutition, which become more marked as the stenosis increases, and lead to defective nutrition. The same signs are present in carcinoma, but the patient shows cachexia

at an earlier stage. Regurgitation of food is usual, and often there is an excessive mucous secretion. Examination with the sound usually demonstrates a stricture, but not always ; pain is sometimes present independent of the taking of food. Œsophagoscopy may directly demonstrate a new growth. The normal deglutition bruit is sometimes absent. In late stages signs of the involvement of other organs may appear, and the supraclavicular glands may be enlarged. The actual stenosis may vary if parts of the growth slough from time to time.

Differential Diagnosis.—The true character of a cicatricial stricture is usually revealed by the history, and œsophageal cancer produces such characteristic symptoms that the diagnosis is seldom in doubt. The affections which may give rise to difficulty are aortic aneurysm, fusiform dilatation of the œsophagus, and diverticulum. In aneurysm other and characteristic symptoms are almost always present, and radiography will aid in diagnosis. Any abrupt change in the stenosis symptoms is against cancer. If there is a disproportion between the difficulty in swallowing and the difficulty in passing a bougie, it will point to spasm. A slow development and the regurgitation of large quantities of decomposed food point to diverticulum.

INDICATIONS FOR OPERATION.

If a cicatricial stricture is situated in the upper part of the œsophagus, if it is annular and shallow and so rigid that it cannot be dilated, then the advisability of total extirpation should be considered. This operation may also be indicated when in such a high stricture there are pouches or kinking above, which oppose great difficulties to non-operative measures (H. Starck). According to Hacker, gastrostomy is advisable in all cases of impassable stricture, particularly of the lower œsophagus. The time of choice for operation is when it has been definitely ascertained that the body weight and the urine secretion are progressively diminishing. In cicatricial stenosis gastrostomy affords the opportunity of retrograde dilatation, and one is only rarely content with the simple provision of a food fistula.

In carcinoma of that part of the œsophagus which lies in the neck, early removal of the growth by œsophageal

resection is indicated. If the carcinoma is below, gastrostomy should be done. There is no general agreement as to the best time for this operation; Hacker advises it *as soon as the difficulty in taking food causes loss of weight.* If the carcinoma is high, and if resection is impossible and feeding by the mouth cannot be continued, œsophagotomy is advised by Starck, and the formation of a fistula for feeding purposes.

PROGNOSIS.—*Results of operation.*—In cicatricial stricture total extirpation is a somewhat serious procedure, but success has been obtained in four-fifths of the cases. The formation of a stomach fistula for the purpose of dilatation from below is very rarely indicated, according to Starck, but in the fifty-two cases reported by Hacker in which other methods had failed, success was obtained by this retrograde dilatation.

Resection for carcinoma is reported by Starck in eighteen cases; five cases died soon after operation; in the others the immediate result was good, but none survived more than two years.

Œsophagostomy often gives very good results; the patient puts on weight and lives for a relatively long period. The results of gastrostomy are better the earlier it is done; frequently it is noticed that food passes the stricture more easily after the operation, and the weight almost always increases for some weeks. The average period of life in 66 cases in the Breslau clinic was five months.

Risks of operation.—Resection of the œsophagus is a serious operation; gastrostomy relatively free from risk. If the stenosis is low down below the aortic arch, and if there are adhesions around, resection is contra-indicated, and œsophagotomy is unsuitable.

If no operation is done, it may be impossible to employ methods of dilatation, in which case the patient dies from starvation.

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CHAPTER XIII.

Diseases of the Stomach.

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DISEASES OF THE STOMACH.

GASTRIC ULCER.

Etiology.—The pathogenesis of gastric ulcer is uncertain. Traumatic lesions of the mucous membrane do not lead to ulcer. Some authors have stated that from 5 to 13 per cent of all individuals are affected with gastric ulcer, but the truth of this is very questionable. The affection is more common in women than in men.

Pathological Anatomy.—In four-fifths of the cases the ulcer is situated on the posterior wall near the pylorus. The front wall is affected in 5 per cent only, but it is here that the perforating ulcer is most common. According to Brunner, of a series of cases of perforating ulcer 278 were on the anterior, 48 on the posterior wall. The annular ulcer is uncommon. The ulcer usually has a sharply-marked edge and may be crateriform ; sometimes the edge is much thickened. If it extends deeply, it tends to form adhesions, which sometimes make up a tumour-like mass. If adhesions form, rupture into the general peritoneal cavity is prevented ; adhesions between the ulcer and the front wall of the abdomen are the least common. Peri-gastric abscesses may result from the penetration of an ulcer, in particular left subphrenic abscess. A healing ulcer may cause pyloric obstruction by contraction of the cicatrix, or if it is about the centre of the stomach, an hour-glass deformity may be produced in this way. In about 5 per cent of cases of chronic ulcer, carcinoma supervenes.

Clinical Course.—The cardinal symptoms of gastric ulcer are : Hæmatemesis, pain shortly after taking food, tenderness on pressure in the stomach area. One or other or all of these symptoms are often absent, and there may

be only a complaint of an indefinite uneasiness in the epigastrium. There are often points tender to pressure alongside the lower dorsal vertebræ, tarry stools, loss of appetite, severe anæmia, and a general disturbance of health. Persistent vomiting without hæmatemesis is also common. If the ulcer is at the pylorus, signs of obstruction develop, such as abnormal peristalsis and contraction of the stomach wall, retention of stomach contents, with fermentative changes and the multiplication of sarcinæ. The amount of hydrochloric acid in the stomach is usually above the normal, and the digestive capacity is unaltered.

If the margin of the ulcer is much indurated it may sometimes be felt as a palpable lump in the epigastrium. If perigastritis supervenes, a large swelling is often to be felt, particularly if adhesions are formed with the anterior abdominal wall; if there is a collection of pus between the adhesions, there will be some pyrexia.

Gastric ulcer frequently runs a very chronic course, the symptoms often subsiding only to recur after a time, and the persistent pain and repeated hæmorrhages may reduce the patient to a very low state of health. According to Leube, perforation occurs in about 1 per cent of cases, but other authors (Broadbent, Brinton, Debove et Rémond) give a much higher figure, even up to 20 per cent. It seems that perforation, which is quite a rarity in Vienna, is much more common in England and America, possibly owing to different habits of life.

In one of my cases small hæmorrhages had frequently occurred; there was persistent pain and tenderness in the epigastrium, and increasing anæmia. She was subjected to a long course of medical treatment, and for a week the stomach was given complete rest, but the symptoms persisted. Operation showed slow perforation of an ulcer, with adhesions; gastro-enterostomy cured her completely.

Diagnosis.—The diagnosis is easy in the presence of the cardinal symptoms; if these are absent ulcer can for the most part only be suspected. The most important symptom of all is hæmatemesis. However carefully the patient is examined, it is usually impossible, according to many authors, to diagnose the position of an ulcer. Acute perforation into the general peritoneal cavity is shown by the following symptoms. There is sudden pain in the

stomach region of intense severity, the abdomen is retracted, the abdominal muscles are board-like, and there are usually repeated attempts to vomit. The patient is collapsed, the pulse small and rapid, the temperature somewhat below the normal, and the respirations rapid and shallow. At the end of several hours, disappearance of the liver dullness is sometimes to be made out, and when the contraction of the abdominal muscles relaxes, the signs of free fluid in the peritoneal cavity can be elicited ; the pulse becomes fuller after the first collapse passes off, but remains rapid, and at the same time the temperature usually commences to rise.

The diagnosis will be assisted by enquiring for a previous history of epigastric pain.

A patient who was undergoing a strict course of treatment for ulcer was suddenly seized with agonizing abdominal pain, although at the time she was resting quietly in bed. Some hours later, when I saw her, she was collapsed, the abdominal wall was rigid and tender to pressure, the liver dullness absent, and the pulse very rapid. Operation was done three hours after the onset of symptoms, and a small perforation was found near the pylorus. The perforation was closed and gastro-enterostomy was performed. The patient unhappily died four days later from peritonitis.

Differential Diagnosis.—It is often difficult to diagnose ulcer from carcinoma. The presence of a large amount of lactic acid and of long bacilli, the absence of hydrochloric acid and sarcinæ, the early onset of stagnation phenomena, diminished digestive capacity of the gastric juice, and painless glandular enlargements, point to cancer. In hæmorrhage from the stomach due to hepatic cirrhosis, the spleen is enlarged and the liver altered.

In cholelithiasis gastric hæmorrhage is uncommon, but if a calculus becomes impacted in the common duct it may give rise to a palpable tumour and symptoms of pyloric stenosis. A test meal will show that the gastric secretion is normal in spite of the stasis, or there may be some excess of hydrochloric acid ; a history of attacks of colic followed by jaundice will also clear up the diagnosis.

In Reichmann's disease, that is to say acid hypersecretion, the pain is usually relieved by the taking of food, and there is no trace of blood either in the stomach contents or the stools.

Hysterical and neurasthenic conditions are differentiated by the irregularity and changeableness of symptoms and the absence of hæmorrhage. Epigastric hernia often causes severe gastric symptoms, which may simulate those of ulcer; the discovery of an irreducible tender hernia in the middle line will clear up the cause of the pains; operation on such a hernia relieved all symptoms in a case which came under my observation, and which had long been looked upon as one of gastric ulcer. Simple erosions of the gastric lining may cause hæmorrhage and other symptoms in such a way as to be indistinguishable from ulcer.

INDICATIONS FOR OPERATION.

Leube, one of the most experienced and expert of clinicians, has formulated the following indications for surgical intervention:—

1.—In hæmorrhage from the stomach, operation is (*a*) Absolutely indicated when the hæmorrhages are small and recurrent in spite of treatment, particularly where gastrectasis coexists; (*b*) Not indicated for a single profuse hæmorrhage; (*c*) Relatively indicated in repeated abundant hæmatemesis.

2.—In the case of severe pains and persistent attacks of vomiting, causing inanition, which do not yield to medical treatment, gastro-enterostomy is relatively indicated.

3.—In perigastritis, gastric adhesions, subphrenic and other peritonitic abscesses, operation is (*a*) Absolutely indicated in abscess arising from ulcer, and in palpable more or less tumour-like inflammatory masses in the stomach region; (*b*) Not indicated, or only exceptionally, after failure of medical treatment when adhesions are only suspected and not palpable.

4.—In ulcer perforating into the peritoneal cavity operation is absolutely indicated as soon as possible after the first shock has passed, but not indicated in what has been vaguely called threatened perforation.

Mikulicz has formulated somewhat similar indications. Surgical treatment of uncomplicated gastric ulcer is indicated (*a*) When phenomena arise which directly or indirectly endanger life, e.g., repeated hæmorrhages, increasing emaciation, commencing perigastritis, and suspected

carcinoma; (*b*) When medical treatment methodically carried out gives either no relief or only for a short period, and the pain, vomiting, and dyspepsia render the patient unfit for work or cause a condition of perpetual suffering.

My own opinion is in agreement with these views, and I would say by way of summary that the treatment of ulcer in its early stages belongs almost exclusively to the physician, and that it is the complications and the chronic forms of the disease which call for surgical treatment. It should be added that the development of a frequent and very important complication of pyloric ulcer—cicatricial stenosis and dilatation—is an absolute indication for surgical intervention, whether signs of ulcer are present or not. Most of the operations performed have been undertaken in consequence of this complication and for perforation. Gastro-enterostomy, pyloroplasty, and gastric resection are the most commonly performed operations; hour-glass stomach has been dealt with either by gastroplasty, gastro-gastrostomy, or gastro-enterostomy.

Contra-indications.—These have been already considered in part. It is not necessary to operate for a single large hæmorrhage, nor for chronic ulcer with hyperacidity and pyloric spasm until medical treatment has proved ineffectual.

Prognosis.—*Risks and results of operation.* The direct operative risks are general collapse and shock, peritonitis, or pneumonia. In perforated ulcer, operation during the first shock may increase the latter to such an extent as to cause death, and it is therefore advisable as a rule to wait until this period has passed. Delay must never, however, be prolonged beyond an hour or two; the chances of recovery are four times greater during the first twelve hours than later. Of 377 cases of perforated gastric ulcer collected by Brunner, 201 (52 per cent) recovered after operation, but his estimate that of all cases operated on at least two-thirds die, and at the highest one-third recover, is undoubtedly correct. The mortality of those operated on during the first twelve hours is about 25 per cent.

It is a striking fact that both after a general anæsthetic and after local anæsthesia, cases of laparotomy not infrequently develop pneumonia, sometimes of a fatal type.

Operative peritonitis is rarer, and tends to become more

and more infrequent. Of all cases of operation on the stomach in the Würzburg clinic, 2 per cent died from this complication, so that it is not altogether negligible.

The operative risk varies with the nature of the operation and the surgeon. Mayo Robson records 165 recoveries in 177 cases, and of eight cases of perforating ulcer of the stomach on which he operated, two died. The cases of resection gave the highest mortality (27·8 per cent). According to Mikulicz the mortality of gastro-enterostomy is 16 per cent, that of pyloroplasty 13 per cent.

The latter operations are therefore generally preferable to resection, but each method has its particular indications ; for example, if an ulcer is situated on the anterior wall resection may be technically easy, and therefore advisable. A complication which occurs after gastro-enterostomy is regurgitant vomiting, but this is to be avoided by proper operative technique and the prevention of any spur or kink preventing the onward passage of the jejunal contents.

In cases of pyloric obstruction, when operation is successful, the motor and secretory functions of the stomach return to the normal in the course of a few months, the hæmorrhages which had resisted medical treatment cease, and the patient loses his sense of discomfort and pain. A recurrence of obstructive signs after operation sometimes takes place, but is rare, as is also a reappearance of signs of ulcer ; Neumann has, however, collected eight cases of peptic ulcer after gastro-enterostomy, four of which succumbed to perforation. The end results of operation are also good ; Mikulicz records 48 permanent recoveries in 54 cases of ulcer and pyloric stenosis ; the best results were obtained by gastro-enterostomy.

Without operation.—The great majority of cases of gastric ulcer recover under careful medical treatment. Leube records, among 424 of his patients, rapid and permanent recovery in 74 per cent after four to five weeks' treatment, improvement in 22 per cent, no improvement in 16 per cent. The percentage mortality was 2·4 per cent. This low mortality corresponds with my own experience. The figures given by some French (Doyen) and English (Barling) surgeons, viz., 10 per cent to 50 per cent, are in my opinion much too high. A repetition of the course of treatment completes recovery in a large proportion of those cases

which are at first only improved. If gastric ulcer is untreated, the mortality on the other hand reaches about 10 per cent; of these 6 to 7 per cent succumb to perforation, 3 to 5 per cent to a profuse hæmorrhage.

According to Gerhardt, cicatricial stenosis of the pylorus occurs in about 10 per cent, and this if untreated by operation will probably prove fatal.

When ulcer persists for a long period, it not infrequently is the starting point of carcinoma.

If not operated on, about 95 per cent of cases of perforation die, 50 per cent during the first twenty-four hours after the accident; the few cases which recover are those in which the stomach was empty at the time of perforation.

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CARCINOMA OF THE STOMACH.

Pathological Anatomy.—The commonest site of carcinoma of the stomach is in the neighbourhood of the pylorus (30 per cent), then on the greater and lesser curvatures (together 30 per cent). In more than 70 per cent the growth is of the scirrhous type; the medullary and

colloid types grow rapidly and ulcerate early. Cancer often develops on the site of an old ulcer; it is almost always a primary growth; the softer growths are the earliest to form metastases. Cancer at the cardiac orifice shows no tendency to invade the œsophagus, and pyloric cancer does not extend to the duodenum.

Clinical Course.—The disease usually begins insidiously. In some cases there are only general symptoms: weakness, rapid wasting, anæmia, loss of appetite, and distaste for food. The most important of the stomach symptoms are regurgitation and vomiting of stomach contents, often acid in taste, vomiting of mucus and coffee-ground masses, pain in the epigastrium, particularly after eating, and tenderness in the epigastrium. The most important sign is the presence of an epigastric tumour. This may move with respiration, but can then be fixed in the situation where it lies on expiration. In pyloric cancer, symptoms of gastric dilatation are often present, the stomach contents are retained long after a meal, there is vomiting of large quantities, and often excessive peristalsis.

Examination of the stomach contents shows absence or diminution of hydrochloric acid, defective capacity of peptic digestion, and later the presence of lactic acid and other stagnation products, even when there is no pyloric stenosis. Numbers of long bacilli and blood pigment material are also often present. The normal leucocytosis of digestion is absent.

Metastases may be clinically recognizable before the primary tumour, particularly glandular metastases above the left clavicle. The development of ascites is almost always a sign of the presence of metastases in the peritoneum or the glands of the portal fissure.

In the later stages fever and cachexia make their appearance.

Diagnosis.—A palpable tumour is the most valuable sign, but the presence of the above-mentioned secretion-anomalies, along with retention of stomach contents and numbers of long bacilli, is sufficient for a fairly confident diagnosis, and it becomes more certain if repeated examination shows that these signs are constant and persistent.

In cancer of the cardiac orifice, the symptoms may be those of œsophageal obstruction, obstruction to the passage

of solid food, delay or absence of the second bruit of deglutition, and the sound may demonstrate stenosis. Pain is then most common at the xiphisternum. The tumour may be visible with the œsophagoscope, but it remains impalpable until the latest stages.

The carcinomatous ulcer usually presents the characteristic ulcer history. When repeated examinations at short intervals demonstrate a change in the gastric chemistry, hyperchlorhydria first disappearing and then giving place to hypochlorhydria, increase in lactic acid, decreased capacity for peptic digestion, multiplication of long bacilli and stagnation phenomena, then the diagnosis will be carcinoma developed from a chronic gastric ulcer.

In a patient fifty years of age the history pointed to gastric ulcer of some years' standing. For six months pain had developed anew after food, vomiting had been frequent, and there was loss of flesh, melæna, and great tenderness on pressure over the stomach. Tenderness was also marked on pressure in the neighbourhood of the lower dorsal vertebræ. Examination of the stomach contents showed at first a high degree of hyperchlorhydria, which later gradually gave place to a normal amount of hydrochloric acid, associated with the appearance of lactic acid and signs of retention of stomach contents. Laparotomy showed a carcinoma on the posterior stomach wall developed on the site of an old ulcer. Gastro-enterostomy was performed, but death occurred some days later.

In pyloric cancer the signs of pyloric stenosis are clinically the most prominent. Lactic and butyric acid are especially abundant; the tumour is palpable comparatively early. In regard to differential diagnosis, there are many conditions which have to be considered. Chronic ulcer is associated with increased amount of hydrochloric acid, and lactic acid is not present. Kinking by adhesions to the gall-bladder, etc., is not associated with any particular change in the chemistry of the secretion. Atonic inefficiency is not associated with tumour or with abnormal peristalsis.

In atrophy of the gastric mucous membrane there is no palpable tumour, examination of the blood shows the changes of progressive pernicious anæmia, and there is no blood in the gastric contents.

The alterations in the gastric secretion are also of value in excluding tumours of the gall-bladder, omentum, intestine, and pancreas. Renal tumours bulge into the loin and lie behind the colon.

Chronic gastric catarrh does not provoke any grave alteration in health; the amount of hydrochloric acid varies, and improvement and changes for the worse alternate. The secretion of mucus is generally excessive; if this decreases one will usually note improvement in the secretory functions.

INDICATIONS FOR OPERATION.

All authors agree that when carcinoma is diagnosed at an early stage operation is absolutely indicated. Unfortunately at this stage diagnosis is attended with great difficulties, and usually no positive opinion is arrived at until a palpable tumour appears. When this stage is reached the disease has usually made considerable progress.

For this reason there are certain signs and conditions which constitute absolute indications for operation, although the diagnosis of cancer may be uncertain. Operation is called for (1) When the signs point definitely to progressive stenosis of the pylorus, and the other signs point to cancer, although there is no palpable tumour; (2) When a palpable tumour is present which is apparently without adhesions to the surrounding parts and has not produced recognizable metastases in other organs; (3) When there is marked interference with the motor function, even when the tumour is not at the pylorus and adhesions cannot be excluded, if vomiting and motor insufficiency are producing inanition.

Opinions differ as to the advisability of exploratory laparotomies. According to what has just been said it is clear that many operations are bound to be exploratory in the first instance, to be followed by a radical procedure under favourable circumstances. Kuttner is of opinion that exploratory laparotomy ought to be considered if the symptoms as a whole suggest cancer, and there is reason to think that it may be possible to remove the growth, particularly if there are definite signs of stenosis. Ringel agrees with Kümmel that if there is a definite suspicion of cancer the abdomen should be opened.

My own view is that exploratory laparotomy should be undertaken in all cases where the clinical phenomena suggest the development of cancer on the site of a chronic ulcer, even when no tumour is to be felt and symptoms of pyloric stenosis are absent.

The operations that may be performed are :—

1. Resection, the radical operation by which alone complete recovery is obtainable.

2. Gastro-enterostomy, to be employed when the tumour cannot be extirpated, when there is marked gastric inefficiency, and there is some hope of prolonging life for a considerable period.

3. Gastrostomy, in cancer of the cardia, to feed the patient and avoid the irritant effect of food passing over the seat of disease. Whether resection or gastro-enterostomy is advisable in any given case it is not as a rule possible to say until the stomach has been opened and the extent of the disease explored.

Contra-indications.—With the following opinion of Mikulicz I entirely agree. He says: "When the result of palpation is negative, and there are no motor disturbances, operation is inadvisable, at least for the time being, even if all other signs point to cancer. Only a radical operation will be considered under such circumstances, and experience has shown that a stomach cancer which has already caused definite clinical symptoms, and yet is not palpable, is almost always so situated as to be inaccessible for radical removal."

Emphysema, chronic bronchitis and tuberculosis of the lungs, if of a pronounced type, contra-indicate operation, and the same is to be said of advanced atheroma, uncompensated heart disease, and any other serious organic lesion.

The presence of metastases, particularly in the liver, and of carcinomatous peritonitis, contra-indicate intervention.

Prognosis.—*Results of operation.* It is difficult to formulate any definite prognosis of operation; the results vary much in the different tables given; some surgeons operate on cases which others would refuse, and the same surgeon obtains different results at different stages of his experience and with different methods. The immediate operation results show recovery in at the most 75 per cent, and on an average about a half or less get over the

operation. The mortality among 56 cases in Mikulicz' hands was 46·5 per cent, in the next 44 cases 25 per cent.

Nine out of twenty-four in Czerny's clinic died from the operation (38 per cent), 17 out of 25 in Rydygier's clinic (68 per cent). Krönlein reports an operative mortality of 28 per cent in 50 resections, Kappeler 26 per cent in 30 cases, Ringel 59·4 per cent in 63 cases, Roux 33 per cent in 39 cases. The Mayos report 5 deaths in 20 cases in a first series, 1 death out of 15 in a second series.

The operative mortality is therefore high, though it varies considerably; approximately a quarter die. The causes of death are shock, pneumonia, pulmonary embolism, cardiac failure, peritonitis. The risks of gastro-enterostomy in cancer are also high. Of 82 cases reported by Ringel, 62 per cent died from shock, pneumonia, peritonitis, pulmonary embolism, or cachexia. Of 96 patients in Roux's clinic, 28 per cent succumbed, 7 from general weakness, 5 from pulmonary complications, 4 from cardiac failure, 4 from faulty technique, 3 from peritonitis, etc.

The end results of resection are comparatively good, considering that the disease is inevitably fatal without operation, but recurrence is the rule. The results in 58 of Mikulicz' cases who survived the operation are as follows: 17 alive more than a year, 10 more than 2 years, and 4 more than $3\frac{1}{2}$ years after the operation. The average duration of life of the cases who died from recurrence was more than 16 months.

Wölfler has recorded several cases alive some years after operation; 14 survived 4 years, 4 more than 5 years, and 2 longer than this.

The average duration of life in the cases reported by Kolbe from Roux's clinic was at the time of publication three years and eight months, the oldest being nine years and four months. The length of life in 12 cases which had died was on an average two years and two months.

Gastro-enterostomy also increases the average duration of life, but not to so marked an extent as gastrectomy. Of 67 patients operated on in Mikulicz's clinic who survived the operation, 2 only lived more than 2 years, 10 more than 1 year, 11 more than six months, and the remaining 44 less than six months. The average duration of life after operation was 6·4 months. Ringel's figures give the

average post-operative survival as six and a half months. In a few cases patients have lived three years or more (Stendel-Czerny, Alsberg, Strauss); a patient under my own observation survived more than two years and a half.

These various statistics show that operative interference of whatever kind is attended with a high degree of immediate risk in gastric cancer, but that nevertheless it is often proper to recommend it in the hope of permanent cure in some cases, in others for the relief of distressing symptoms and for the prolongation of life.

The general condition is often remarkably good after resection; the patient puts on weight and regains appetite. Slight epigastric uneasiness often persists, and there may be distaste for flesh foods. In some cases the anæmia persists for a long time. The stomach often regains its normal motility, according to Mikulicz, and sometimes this even surpasses the normal. The gastric secretion does not as a rule return to the natural state, but sometimes free hydrochloric acid reappears; the production of lactic acid on the other hand tends to persist for a long time.

The effect of gastro-enterostomy is much less striking. I have indeed seen cases who improved for a time and put on weight, but after a short period they commenced to go down hill and rapidly succumbed. In the majority of cases the general condition is little changed, and the marasmus remains. Some symptoms, however, vomiting and fœtid eructations, are often greatly relieved, and in cases of pyloric obstruction the pains due to spasmodic contractions of the stomach are eliminated.

Without operation.—When there is no pyloric obstruction, the general symptoms, weakness, anæmia, etc., are the most prominent. Patients usually succumb with symptoms of heart failure; in other cases they die from septicæmia. If there is pyloric obstruction, the disease runs a rapid course, and the repeated vomiting of the stagnant stomach contents quickly exhausts the strength. My experience, however, agrees with that of others who have recorded improvement, and even increase of weight in some cases in which the stomach has been regularly washed out. In ulcerating carcinoma, hæmorrhages and fever complicate the history, and once metastases form the progress of the disease is very rapid.

According to Krönlein, cancer of the stomach without surgical treatment terminates fatally in about a year; Riegel places the average period between one and two years. When the carcinoma causes pyloric stenosis, the course of the disease is often very short. I have seen death supervene in a few weeks after the onset of the first clinical symptoms.

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SIMPLE TUMOURS AND FOREIGN-BODY TUMOURS OF THE STOMACH.

Etiology.—The foreign-body tumours of the stomach occur from the habitual eating of hair or vegetable fibre,

or gelatin-containing fluid. They are found most commonly in women, and relatively frequently in young girls. The simple, true growths of the stomach (myoma) may occur at any age.

Pathological Anatomy.—The foreign-body masses are often freely movable in the stomach; when of large size they may have the shape of a complete cast of the stomach, as in a case recorded by myself. Ulceration and perforation, with consequent peritonitis, are typical results.

The simple new growths are uncommon; usually they are myomata, and may attain a large size, protruding more frequently into the peritoneal cavity than into the stomach. In two cases I have seen transformation into sarcoma.

Clinical Course.—Foreign-body masses can often be recognized by palpation. At first they are freely movable, and at this stage the stomach symptoms are slight, but later vomiting becomes uncontrollable, with pain in the epigastrium and signs of peritoneal irritation. After several years they may cause perforation and peritonitis.

The true simple growths are also compatible with long life. The secretory functions of the stomach are little interfered with, and whether or not its motor functions are embarrassed depends on the site and attachments of the tumour.

Diagnosis.—A positive diagnosis is only exceptionally arrived at in the case of the foreign-body masses. A history of long ingestion of hair or vegetable fibre in a young individual, free mobility of the swelling, which is shown by inflation to belong to the stomach, and in particular the discovery of hair in the fæces, will point to the true nature of the case. Incorrect diagnoses of stomach cancer, movable kidney, splenic tumour, and renal tumour have been made.

A tumour of the stomach which has been known to have been slowly growing for some years, is probably of a simple nature; the general condition will be good, and the functions of the stomach normal. A correct diagnosis is rarely made, the condition being usually taken for carcinoma.

INDICATIONS FOR OPERATION.

If a tumour is found in the stomach region, and there is even a suspicion of its being a hair ball or similar mass, an operation should be advised, and signs of peritoneal

irritation point to its being urgently necessary. Perforation is of course an absolute indication for intervention. The foreign body will be removed by gastrotomy, the stomach being then closed. Benign new growths also call for extirpation and partial resection of the stomach; the fact that these growths sometimes become malignant makes their removal necessary, even though they may be causing little inconvenience. The only contra-indication to operation is the presence of some condition which renders abdominal section a risky proceeding.

PROGNOSIS.—*Results of operation.* All the cases of operation for hair ball which were collected by Schopf, nine in number, were successful. Since the appearance of his paper further successes have been recorded. Operation for myoma is a more serious undertaking, as it involves partial gastrectomy.

Without operation.—Hair balls and other similar masses relatively often cause pressure necrosis of the stomach wall and fatal peritonitis. A myoma may undergo sarcomatous transformation. If pedunculated it may become strangulated by torsion of the pedicle, and in this way cause danger to life.

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PYLORIC STENOSIS, GASTRIC DILATATION, AND HOUR-GLASS STOMACH.

PATHOLOGICAL ANATOMY.—Stenosis of the pylorus may arise from a variety of causes. In some cases it follows

carcinoma or the cicatrization of an ulcer; in others adhesions cause kinking, or the outlet is compressed from without or blocked by a gall-stone. Clinically the stenoses in the neighbourhood, as far as the papilla of Vater, may be classed with the stenoses of the actual pylorus. In a group of cases the obstruction is due to pyloric spasm. When pyloric stenosis has been present for some time, the stomach becomes secondarily dilated and the muscular wall hypertrophied.

Hour-glass stomach is usually caused by the cicatrization of an ulcer of the body of the stomach, more rarely by carcinoma or adhesions.

Clinical Course.—Certain symptoms are common to stenosis, however caused; others vary according to the original lesion. In all cases there is a sensation of fullness in the stomach region, and usually loss of appetite and eructations. Vomiting is hardly ever absent, and the motor functions of the stomach are altered.

In the slighter forms (motor inefficiency of the first degree) there is long delay in emptying the stomach, but by the early morning the organ has passed on its contents and is empty.

In motor inefficiency of the second degree there is always food material in the stomach; splashing can be elicited over a wide area, and many hours after a meal. When the stomach is inflated, it is seen that it extends abnormally low. If the patient is given salol, the elimination of salicylic acid and phenic acid in the urine persists for an abnormally long time.

Very often, particularly when the condition is advanced, a very pronounced peristalsis can be seen and felt passing from left to right; these tetanic contractions are painful, and as the wave passes the wall becomes consecutively contracted and relaxed.

The state of the gastric secretion depends on the nature of the causal condition. When there is hyperacidity the total amount withdrawn with the stomach tube is often considerably greater than that which the patient had swallowed. Almost always sarcinæ are present when hydrochloric acid is present, and lactic acid when hydrochloric acid is absent. A diminution of hydrochloric acid runs parallel with a diminution of sarcinæ; when the amount of lactic acid

is large the long bacilli are numerous and the sarcinæ few. The amount of urine secreted is usually small, and decreases as the stenosis becomes more pronounced; the patient complains much of thirst, and is constipated. Generalized tetany, involving the muscles of the trunk, diaphragm, and larynx, may be the cause of death.

Diagnosis.—The presence of motor inefficiency and stagnation of gastric contents will lead to a diagnosis of pyloric obstruction. When remains of food are found in the stomach many hours after a meal, and there is abnormal peristalsis, the diagnosis is quite clear, but the cause can only be determined by careful examination into the chemistry of the stomach, the history, and the other symptoms.

Hour-glass stomach can sometimes be diagnosed by inflation. In some cases, on pressure at the cardiac end, the contents can be made to pass with a rush through the stricture. The presence of marked and painful peristalsis is against simple atonic dilatation, this symptom being usually absent in the latter.

Spasmodic stenosis of the pylorus does not seem to often cause marked motor inefficiency; if the latter is present, it is not possible to differentiate between spasmodic and anatomical stenosis.

INDICATIONS FOR OPERATION.

If there are definite signs of stenosis, but the motor inefficiency is of the first degree only, operative interference is in general only indicated when new growth is suspected. If, however, in the presence of motor inefficiency of the first degree, the patient suffers much and is unrelieved by medical treatment, or if in consequence of his occupation or other cause he cannot submit to a long course of medical and dietetic treatment, operation is justified. This is particularly the case when the patient understands the risks and is still anxious for operation.

Motor inefficiency of the second degree is an absolute indication for operative treatment; this is also the case when the symptoms steadily advance in spite of medical treatment, the urine becoming small in quantity and the patient losing weight and strength.

The primary object of operation will be to deal with the

actual cause of the stenosis, that is to say, in cancer by resection, in the case of adhesions by their detachment. In cicatricial stenosis, however, and in inoperable cancer, gastro-enterostomy is the method of choice for the relief of obstruction. Hour-glass stomach may be dealt with either by gastrogastrostomy, gastro-enterostomy, or gastroplasty, or a combination of more than one method.

Contra-indications.—All the conditions which militate against the success of a serious operation—advanced age, marked atheroma, heart lesions, diabetes, etc.—are contra-indications.

If the clinical phenomena point to a motor inefficiency of a slight degree, operation should not be advised until medical treatment has been given a trial. In the presence of tetany or symptoms of auto-intoxication, such as acetonuria, albuminuria, Trousseau's sign, etc., operation is not advisable.

Gastric neuroses are in general not suitable for operative treatment.

Prognosis.—*Results of operation.* The results of operation vary with the nature of the causative lesion. In many cases recovery is complete, the pains and stagnation phenomena entirely disappear, and the motor and chemical functions return to the normal. In carcinoma, however, even after resection the gastric secretion does not entirely regain its normal composition. In a few cases a certain degree of dyspepsia and motor inefficiency persist. In many cases of hour-glass stomach the result of operation has been very good ; Moynihan has reported six recoveries, Fradà three. The operative mortality of the condition is 8·9 per cent.

Risks of operation.—The risks of operation, apart from those common to abdominal section, depend upon the extent of the necessary procedure. Gastric resection, whether for simple or malignant stenosis, is attended by the highest mortality, while that associated with gastro-enterostomy and pyloroplasty is much smaller (See articles on Gastric Ulcer and Carcinoma of the Stomach).

Pneumonia occurs in a certain proportion of cases, and is often of a severe type. After gastro-enterostomy, peptic ulcer of the jejunum has been recorded, and in a few cases has led to fatal perforation.

Without operation.—Gastric inefficiency of the first degree is often successfully treated by medicinal and dietetic means. In marked inefficiency, on the other hand, the patient steadily loses ground and eventually succumbs. In a fair number of cases generalized tetany is the cause of death; in three under my own observation the convulsions involved the extremities and back, and finally the diaphragm and the laryngeal muscles. In hour-glass stomach the prognosis is similar: the patient suffers from inanition and exhausting pain, and the affection may end in perforation or fatal exhaustion.

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CONGENITAL HYPERTROPHIC STENOSIS OF THE PYLORUS.

This condition is usually found in children of healthy parents, but more than one infant in the same family may be affected.

Pathological Anatomy.—Usually the pyloric stenosis is of a most marked degree; the wall is much thickened, due to the hypertrophy of the muscular coat. The stomach is usually dilated.

Clinical Course.—The most important signs are uncontrollable vomiting, setting in soon after birth, and the presence of a lump in the epigastrium. Cachexia usually supervenes in a short time. There is often both motor and chemical inefficiency of the stomach and obstinate constipation. If constant vomiting comes on soon after birth, and the vomited matter never contains bile pigment, while at the same time there is a lump in the epigastrium and exaggerated peristalsis, the diagnosis is clear.

INDICATIONS FOR OPERATION.

If the characteristic symptoms are present, and do not yield to internal treatment, and if the child is losing weight, operation is called for. It is urgent when the child, although hungry, can no longer take the breast. The usual and only satisfactory procedure is gastro-enterostomy. Operation should not as a rule be advised until a trial has been given to medical treatment.

Prognosis.—Trautenroth has collected 12 cases submitted to operation; among these there were 5 fatalities; the remaining 7 made a complete recovery. Without operation the majority of cases succumb to inanition; in some cases the symptoms are relieved by medical treatment.

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CHAPTER XIV.

Diseases of the Intestines.

Chapter XIV.

DISEASES OF THE INTESTINES.

DUODENAL ULCER.

The round ulcer of the duodenum is a distinct clinical type, and it is therefore proper that it should be given a special article. It is more common in men than in women, and occurs most frequently in individuals of middle age and in young children. Alcoholism, chronic tobacco poisoning, burns, and frost-bites appear to have etiological relationship with the condition. It has been found in a considerable number of instances in patients affected with nephritis and cardiac disease. There is a difference of opinion as to whether it ever results from trauma.

Pathological Anatomy.—The ulcer is usually solitary, varying in size from a lentil to a florin. It is usually found in the upper horizontal portion of the duodenum. Perforation occurs in a large proportion of cases, probably more than a third, either into the general peritoneal cavity or some neighbouring organ. Subphrenic abscess is relatively common. When the ulcer heals, the resulting cicatricial contraction may cause stenosis; profuse hæmorrhage sometimes occurs from erosion of large vessels.

Clinical Course.—In many cases there are either no symptoms, or only some slight complaint of discomfort. In other cases there is pain coming on usually a long time after a meal, and often relieved by again taking food or by alkalies. There is tenderness as well as pain in the neighbourhood of the pylorus. Vomiting and retention of stomach contents are common, and in a third of the cases there is hæmorrhage, evidenced by melæna or hæmatemesis.

Chronic perforation of the ulcer usually causes intense localized pain and peritoneal symptoms, i.e., meteorism, diffuse tenderness, fever, and sometimes free exudation.

If signs of subphrenic abscess develop, the gastric symptoms are overshadowed. In other cases pus makes its way downwards, and appendicitis is simulated.

Acute perforation is associated with symptoms similar to those of perforation of a gastric ulcer.

Diagnosis.—When there is a history of long-continued pain in the right hypochondrium, which reaches its maximum some hours after taking food, is not particularly altered by vomiting, and is increased by pressure in the pyloric region, duodenal ulcer will be suspected, and the diagnosis will be sustained if blood is present in the stools. It will be remembered that the condition runs a chronic course, and is particularly associated with extensive burns. It is only rarely that a definite diagnosis is made.

With regard to the differentiation from gastric ulcer, it should be remembered that duodenal ulcer is particularly common in the male, and that it is not often accompanied by hæmatemesis. Cholelithiasis is very rarely associated with melæna, and the history of the case, the examination of the gall-bladder by palpation, and, possibly, the passage of calculi, will render the diagnosis clear.

From appendicitis duodenal ulcer is distinguished by the seat of the pain, the maximum point of tenderness, and the periodicity of the pain ; a tender swelling in the right iliac region will of course point to the appendix.

INDICATIONS FOR OPERATION.

Duodenal ulcer has rarely been directly treated by operation on account of the difficulties of diagnosis. The indications for operation are virtually the same as in gastric ulcer (q.v.). It is usually confounded with the latter, and the actual seat of the ulcer has often been demonstrated only at operation or autopsy.

Perforation occurs in a large proportion of cases, and furnishes an absolute indication for operation. The same is true of the other common complication, subphrenic abscess. As the subphrenic abscess following duodenal ulcer does not differ in features from that arising from other causes, the reader is referred to the special article on the subject. It may simply be said here that the definite presence of a subphrenic empyema calls for operation, whatever the cause. Chronic perforation

may give rise to abscess in other situations, and these also necessitate operation.

Repeated hæmorrhages, revealed by melæna or hæmatemesis, constitute an indication for operation if medical treatment fails and the patient becomes anæmic and declines in general health. Gastro-enterostomy is the operation of choice.

Contra-indications.—Operation will not be advised until medical treatment has been properly tried. A single hæmorrhage, even if large in amount, does not necessitate operation. Generally speaking, the contra-indications are the same as in gastric ulcer.

PROGNOSIS.—*Results of operation.*—In cases of acute perforation the prognosis is very serious, even if operation is done soon after the accident. Laspeyres has collected 17 cases; in 2 the perforation could not be closed, and had to be tamponed; both were fatal. Of the remainder a third recovered. In two unpublished cases of my own, death occurred in spite of operation. In Pagenstecher's 28 collected cases the mortality was 86 per cent. The figures of Weisl and Foote show how important is early operation; those operated on within eleven hours gave a mortality of 39 per cent, those operated on between the twelfth and twenty-fourth hour gave a mortality of 76 per cent, and of those dealt with later, 87 per cent died.

In a considerable number of cases complete recovery has followed gastro-enterostomy.

These figures show that duodenal ulcer is a grave disorder, and often causes complications which have to be dealt with by operation to save life. The mortality of these complications is still to-day very high.

Without operation.—Death occurs in many cases from perforation or profuse hæmorrhage. In some cases the affection runs a very chronic course; remissions alternate with exacerbations over a period of many years. In a not inconsiderable number of cases healing results in a cicatrization which causes stenosis.

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DUODENAL STENOSIS.

Etiology and Pathological Anatomy.—The cause of duodenal stenosis may be outside the bowel, as in the case of adhesions, tumours of the pancreas, and glandular tumours, or within the lumen itself, as in cicatricial contraction after ulcer, gall-stones, and tumours of the gut. The point of stenosis may be in any of the three parts of the duodenum.

Clinical Course.—Obstruction may set in acutely, and begin, as in other forms of acute obstruction, with marked collapse, vomiting, etc. Meteorism and fæcal vomiting, however, are absent, and fæces and flatus may be passed. The stomach is often much distended.

Suprapapillary stenosis is clinically similar to pyloric stenosis, and cannot be distinguished from it. When the obstruction is in the neighbourhood of the papilla, the signs of common duct obstruction are present (jaundice, bile in the urine, and colourless stools), and the stools are fatty, from obstruction of the duct of Wirsung. When the stenosis is below the papilla there is often copious vomiting of bilious matter, and on washing out the stomach the fluid at the end of the washing is bile-stained. This last sign was most marked in one of my cases. The gastric secretion often shows no diminished digestive capacity, but free hydrochloric acid is often absent. This phenomenon

is sometimes only transitory, and the variability of the symptoms is quite a characteristic feature of infrapapillary stenosis. When the stomach is empty of food, alkaline duodenal secretion can sometimes be obtained from it, showing action on proteid, starch, and fat.

Diagnosis.—The symptoms just enumerated will be sufficient for a diagnosis. The vomited matter is abundant and the epigastrium distended. General meteorism is against duodenal stenosis. Differentiation from pyloric stenosis is often not easy; the chemical changes, however, in many cases demonstrate the situation of the stenosis. Chronic obstruction of the common duct by calculus is distinguished from duodenal obstruction by the absence of duodenal secretion from the stomach and by the history of the case.

INDICATIONS FOR OPERATION.

Operative treatment is necessary whenever serious symptoms make their appearance, and do not yield to internal treatment. Under this heading come persistent vomiting, increasing inanition, diminution of urine secretion. The presence of these justifies intervention.

The operation will either be gastro-enterostomy, removal of a biliary calculus, or the separation of adhesions. The removal of a neoplasm will depend upon the presence or absence of metastases.

Sometimes duodenal perforation is a consequence of stenosis, and operation will of course be done here as in a perforating ulcer, in both the acute and the chronic types.

Contra-indication.—Operation will not be advised until lavage and medical treatment have been tried and failed to relieve.

Prognosis.—Operation has been relatively seldom done for duodenal stenosis. The risks are the same as in the operation for duodenal ulcer. In many of the cases the condition has been entirely cured. If no operation is undertaken the symptoms can sometimes be relieved in part by medical treatment; if this is not the case, death will follow sooner or later from inanition and cachexia.

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INTESTINAL TUBERCULOSIS.

Etiology.—In the great majority of cases intestinal tuberculosis is a secondary affection, and is therefore dependent on all conditions which tend to establish tuberculosis in the lungs and other organs. It may develop at any age; the tumour-like tuberculous masses are most frequently found in the middle-aged.

Pathological Anatomy.—There are three types distinguished:—(1) The disseminated type, without tendency to healing; (2) The solitary or multiple type, with tendency to healing; (3) The tumour-like tuberculosis of the ileocæcal region. In the second type, solitary or multiple ulcers are formed, and the solitary ulcer is usually in the ileocæcal region. If the ulceration extends transversely to the axis of the bowel, stenosis tends to follow its cicatrization. Such strictures are not uncommonly multiple; as many as fifteen have been met with; sometimes they are annular, sometimes tubular. They are most frequent in the ileum.

The tumour-like mass of the ileocæcal region remains long localized, and stenosis may result from great thickening of the bowel wall.

According to Conrath, the lesions of intestinal tuberculosis may commence in the subserous layer or as ulcers of the mucous membrane. In some cases they are more numerous in the ileum, in others in the cæcum, and in old-standing cases they may be widely distributed.

The peritoneum may remain free from involvement, even in cases where the other lesions have long been present.

Clinical Course.—With stenosing tuberculosis of the

bowel, patients are usually in indifferent general health, and usually have clinically recognizable tubercular lesions in other organs. The disease as a rule begins insidiously, and the first sign is irregularity of the bowels, and constipation, alternating sometimes with diarrhœa. There is usually a complaint of dull intermittent pains in the abdomen, the attacks becoming more and more frequent. During an attack there is exaggerated peristalsis, and distended and firmly-contracted coils are to be felt ; the pains are severe, and pass off with borborygmi. The peristaltic movements concern the small intestine. Vomiting is common, and during the attack neither fæces nor flatus are passed. Occasionally there is slight fever.

The symptoms of the tumour-like ileocæcal tuberculosis are also those of intestinal stenosis, but the typical attacks of stenosis may be preceded for months and even years by indefinite pains in the abdomen without any constant localization.

Attacks of severe diarrhœa or of large hæmorrhages are unusual. After the symptoms have been present for some time, a hard, nodular, slightly tender and mobile mass becomes recognizable in the ileocæcal region, which gradually becomes immobile. In some cases cold abscesses are formed, and perforation of the tuberculous bowel may take place into other hollow organs or the exterior.

In both of these types of intestinal tuberculosis the peritoneum is, as a rule, not affected.

Diagnosis.—If intestinal stenosis makes its appearance in a young individual, with tuberculosis in some other organ, it is probably tuberculous in nature. The discovery of small and repeated hæmorrhages in the stools revealed by the guaiac or aloin tests, or of tubercle bacilli, will make the diagnosis certain. If it is possible to diagnose multiple intestinal stenosis in a young patient without syphilitic lesions or history, the probability is that it is due to tuberculosis.

In several cases I have found it possible to diagnose multiple tubercular stricture without palpable tubercular masses. In all I have met with five such cases, and I look upon the following points as characteristic : the repeated observation of simultaneous spasmodic contraction in different segments of bowel at a distance from one another, the intervening segments remaining flaccid, particularly if

these are of different diameter and there is no general meteorism; the practically identical position of these contracted segments during the different attacks; the simultaneous disappearance of the contractions, along with marked intestinal gurgling.

One of my patients was a man of twenty-three, who complained of cough and presented an early consolidation of the right apex. For three years he had had attacks of abdominal pain off and on, the attacks passing off with gurgling, and increasing in frequency. Contractions, sometimes simultaneous, of three different thickened intestinal coils, could be recognized, and the diagnosis of multiple tubercular stricture of the bowel was made. The operation revealed three tubercular strictures, the lowest in the ileocæcal region. Entero-anastomosis was performed. The patient died from peritonitis on the fifth day; the autopsy showed the presence of a fourth stricture.

In another case multiple tubercular stenoses were diagnosed from the presence of similar symptoms; there was no syphilis and no pulmonary tuberculosis. Operation revealed the presence of twelve tubercular strictures. Entero-anastomosis was performed, and two metres of small intestine were excluded. The symptoms of stenosis disappeared, and except for insignificant pains the boy is well a year and a half after operation.

Ileocæcal tuberculosis in the form of a tumour-like mass can be recognized when intestinal stenosis is associated with a mass in the right iliac region in a tuberculous individual, the symptoms being chronic and associated with a subfebrile temperature.

A case under my care was that of a woman aged 50, with early apical lesions. Associated with diarrhœa and severe pain, a hard nodular mass developed in the ileocæcal region. The general health suffered greatly, and she became anæmic. The pulmonary condition, which was confirmed by bacteriological examination, led one to diagnose intestinal tuberculosis. The operation showed marked thickening of the wall of the lower part of the ileum and of the cæcum, and tubercular ulcers of the mucous membrane in the same portions of gut. The lumen of the bowel was reduced to the diameter of a quill. Resection was performed, and the intestinal symptoms disappeared.

Differential diagnosis is often difficult and sometimes impossible. From new growth the affection is distinguished by its more chronic course, by the association with tubercular lesions elsewhere, and by preceding diarrhœa. These points led me to diagnose tuberculosis in a patient in spite of his advanced age, whom I saw some years ago, and the operation proved that the opinion was correct. Long observation is sometimes necessary before cholelithiasis or nephrolithiasis can be excluded.

One of my cases was that of a hospital sister, apparently in good health. For some years she had suffered from severe pains, which were first ascribed to cholelithiasis and later to renal calculus. I saw her during an attack, found a lump in the ileocæcal region, and diagnosed chronic appendicitis ; the possibility of tuberculosis was also considered in view of her occupation. A tumour-like mass was found at the operation, involving the cæcum and causing stenosis. Entero-anastomosis was performed, and permanent relief of symptoms followed.

Before operation diagnosis may be impossible from chronic non-tubercular appendicitis, chronic intussusception, and other conditions.

INDICATIONS FOR OPERATION.

Many of these cases are operated on for some other supposed condition, the diagnosis being made only when the abdomen is opened. There are two signs which indicate the necessity for intervention : symptoms of intestinal stenosis, and the presence of a mass in the ileocæcal region.

If the symptoms of intestinal stricture are definite, and if in addition to the sign of contracture the bowel wall can be felt to be markedly hypertrophied, the stenosis is evidently extreme, and surgical intervention is absolutely necessary.

The presence of a mass in the ileocæcal region, associated with pain, fever, or stenosis symptoms, is also an indication for operation.

If the signs are sufficient for a diagnosis of multiple stricture, this in itself is an indication for operation.

The operative procedures employed are : exclusion of a portion of the gut by entero-anastomosis, or resection of the affected segment, a much more serious undertaking.

Contra-indications.—A state of pronounced cachexia, advanced pulmonary tuberculosis, amyloid disease, and any serious complications in other organs, contra-indicate operation. If tubercular peritonitis is present, no complicated operative procedure is advisable.

Prognosis.—*Results of operation.*—Eighty-one cases of tubercular ileocæcal "tumour" have been analysed by Conrath. In 48 cases resection with anastomosis was practised, and of these 9 either died after the operation or remained unhealed, while in 5 others it was necessary to establish an artificial anus. With regard to the end results, 30 cases who recovered after operation had the following subsequent histories: 11 died from a month to four years later, 4 from local return or tubercular peritonitis, the remainder from phthisis pulmonalis; of the 19 survivors, 2 had had recurrence, and 16 remained well several years after operation.

Entero-anastomosis was performed in 10 of Conrath's cases, with 9 recoveries, and in 8 of these the relief was permanent; in 8 cases the affected segment was excluded, some with and others without subsequent removal of the excluded portion; two of these cases died from the operation.

There are many unpublished cases. Lotheissen, for example, has performed entero-anastomosis in five of my cases during the last two years.

After operation the intestinal troubles have in many cases disappeared, and the general health has become excellent. In other cases, in some of my own for example, attacks of pain and distension have persisted during the first month after operation, relieved by aperients. Probably these were due to spasmodic contractions of the bowel. Several of these cases have later entirely lost their symptoms. Occasionally, in spite of operation, the tubercular process progresses and gives rise to abscess or tubercular peritonitis.

Without operation.—The stenosis is progressive in character, and the pains and other symptoms increase in severity. Acute obstruction or perforation of the bowel may prove rapidly fatal. If a perforation occurs gradually, intestinal fistulæ or artificial anus may result. In some cases a slowly progressive suppurative peritonitis develops; this I have myself seen in several cases.

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ACTINOMYCOSIS OF THE INTESTINE.

Infection usually comes from eating wheat grains, and most commonly occurs in men of middle age.

PATHOLOGICAL ANATOMY.—The rectum and the cæcum are the parts most often affected. Of 111 cases collected by Grill, in 62 the cæcum and appendix were the certain or probable original seat. The disease is a chronic inflammatory process, leading at one and the same time to tissue proliferation and tissue necrosis, extending deep to the surface and invading neighbouring structures after the formation of adhesions. In some cases extension is chiefly towards the peritoneal cavity, in others towards the abdominal wall. The disease often causes the formation of intestinal fistulæ; the infiltration which occurs is often very wide in extent.

CLINICAL COURSE.—The development of the disease is of a chronic type. The following stages may be distinguished: (1) The early stage, with indefinite phenomena and often intestinal catarrh. (2) The stage of tumour. After some months a mass, which often reaches considerable proportions, forms, usually in the ileocæcal region; later it becomes incorporated with the abdominal wall, is ill-defined, intensely hard, and usually very slightly tender to pressure. (3) The stage of fistulæ. The infiltration usually reaches the

surface at several points, and forms several fistulæ, with a complicated system of holes and passages. The characteristic yellow-gold granules are found in the pus. The fistulæ may connect with the bowel, and the discharge is then fæculent. Symptoms of intestinal stenosis are absent. There is usually some fever, and the general condition suffers to a marked degree. Perforation into the general peritoneal cavity is very unusual; the formation of fistulæ into neighbouring organs is common.

Diagnosis.—The disease is sometimes recognized in the second stage, when there is an infiltration of intense hardness with a history of chronic development; more often the diagnosis is not made until fistulæ form, the granules are recognized in the pus, or the organism is demonstrated in portions of tissue removed. In the stage of freely movable mass in the ileocæcal region, a definite diagnosis from appendicitis, carcinoma, and other conditions is practically impossible. When invasion of the abdominal wall has taken place, the condition is distinguished from ordinary cellulitis by the acute course of the latter and the marked constitutional disturbance, and from true tumours of the parietes by the more defined limits of the latter, by the absence of fever and of extensive infiltration of the skin.

When fistulæ have formed, diagnosis has to be made from tuberculosis, chiefly by the result of examination of the discharge, and from syphilis.

INDICATIONS FOR OPERATION.

If a tumour is present in the ileocæcal region, if fever and pain are present, laparotomy, with resection of the mass, or entero-anastomosis, is indicated. If the abdominal wall is infiltrated, it is necessary, if iodide of potassium gives no result, to slit up the whole area of fistulous tracts, and if this proves unsatisfactory to remove the whole area with the knife and spoon.

Contra-indications.—If the diagnosis of actinomycosis is tolerably certain and the delimitation of the mass indefinite, it is not of much use attempting radical extirpation, as the disease is practically certain to extend in spite of it.

Prognosis.—*Results of operation.*—The results of operative treatment are comparatively good, considering that it is seldom possible to remove the whole area of disease. Of

Grill's 111 cases operated on, 45 died, 22 were cured, and 10 improved.

Without operation.—Without energetic treatment intestinal actinomycosis is a very aggressive process, and never tends to spontaneous cure. Iodide of potassium given internally seems to have some favourable influence on the disease, but recovery without operation is excessively rare.

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CHRONIC DYSENTERY AND ULCERATIVE COLITIS.

Etiology and Pathological Anatomy.—Chronic dysentery follows the acute disease, both the amœbic form and the so-called catarrhal form. The ulcers are usually in the descending colon, are often of considerable depth and extent, and have thickened edges. When extensive, the ulceration gives a dense, thickened feeling to the whole bowel. Secondary peritonitis is uncommon.

Under the title of ulcerative colitis a series of affections is described, with different pathological lesions; catarrhal, dysenteric, tubercular, and syphilitic processes have been thus grouped together. The ulcerative condition may involve more or less the whole colon, causing dense infiltration throughout its whole length.

Clinical Course.—Kartulis describes the following clinical types of chronic dysentery:—(1) That in which the

symptoms follow an acute attack and persist in a milder form for many months. (2) In the course of convalescence from acute dysentery a relapse takes place, and improvement alternates with relapse for a long time. (3) At the beginning the symptoms are only those of catarrhal diarrhœa, dysenteric symptoms coming on later.

Tenesmus is not pronounced in chronic dysentery; the stools are liquid, of greenish or black-brown colour. Blood, mucus, and pus are often present in considerable quantity. Pain and tenderness are present along the colon, whose wall is usually much thickened. Meteorism is often marked. In the severer cases the number of stools is very great and the amount of blood considerable. Fever and vomiting are also common.

In ulcerative colitis the same clinical phenomena are presented, but there is no history of a preceding attack of acute dysentery.

Diagnosis.—In the presence of the symptoms just described, after an acute dysenteric attack the diagnosis is clear. The passage of large quantities of mucus, blood, and pus, tenderness and resistance along the colon, diarrhœa, and sometimes tenesmus, point to the presence of ulcerative colitis. From hæmorrhoids both conditions are distinguished by the diarrhœa and the purulent discharge. From new growth the diagnosis is often difficult, but the great extent of the infiltration and thickening of the bowel will be evidence against this.

INDICATIONS FOR OPERATION.

If the methods of treatment which are advocated for obstinate and advanced ulcerative lesions of the bowel are ineffectual, if the patient is steadily losing strength and there is much suffering, surgical intervention is called for with a view to giving rest to the affected portion of bowel.

The methods which have so far been employed are the temporary establishment of an artificial anus at the cæcum or near it, or the performance of an entero-anastomosis excluding the affected bowel. Occasionally portions of intestine have been resected. The artificial anus has been closed after a period varying from six weeks to two and a half years; in some cases, however, it has not been possible to

close it even after several years. Operation should not be resorted to until other methods have been tried.

PROGNOSIS.—*Results of operation.*—Colostomy is an operation not entirely free from risk, and resection is much more dangerous.

A considerable number of cases have been operated on—Hermann's recent statistics include 50—most of them with good results. Twenty-four of these cases were cured and eleven relieved. The artificial anus cannot be closed for several months at the earliest, the time varying considerably, as has already been remarked. Ewald, Körte, and others have reported unsuccessful cases, and probably several others have not been recorded in which no improvement or only the relief of a single symptom, such as pain, was obtained. Six fatal cases are on record.

Without operation.—The prognosis of chronic ulcerative lesions of the colon is extremely grave in the average case. Anæmia, persistent suffering, and wasting usually end in death after a long, trying illness. The apparently cured often relapse.

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MUCOUS COLITIS AND MEMBRANOUS ENTERITIS.

ETIOLOGY AND PATHOLOGICAL ANATOMY.—The disease is far more common in women than men, and occurs especially in "nervous" individuals. Diseases of the female genital organs and chronic constipation are important

etiological factors. Membranous enteritis not infrequently follows irrigation of the bowel with irritating fluids, solutions of alum, tannin, nitrate of silver, etc. Hitherto little has been recorded on the pathological anatomy of the disease; usually there are no recognizable signs of intestinal inflammation.

Clinical Course.—The different types have one symptom in common, the passage of mucomembranous masses; these often take the form of tubular masses of coagulum of a greyish white colour; in other cases these are merely shreds and ribands. The passage of these masses occurs usually at intervals, and is accompanied by much pain; the intervals between attacks vary, sometimes extending to a month. Constipation is usual in these cases, even in the intervals when no mucus is passed. In other cases the passage of membrane is continuous but painless, the patients suffering alternately from constipation and diarrhœa.

Diagnosis.—The passage of the membranous material is sufficient to show the nature of the disease. From simple catarrh with mucous discharge it is differentiated by this passage of membrane and in some cases by the recurrence of attacks.

INDICATIONS FOR OPERATION.

In several cases an artificial anus has been established and the colon irrigated. In other cases intestinal adhesions have been separated, or a uterus, fixed in a position of retroversion, has been rectified.

The affection itself is not so troublesome or dangerous as to justify as a rule any operation of a serious nature. The number of cases so far operated on is not sufficiently large for the formulation of any definite indications.

Certainly operation should only be advised as a last resource when medical treatment has entirely failed, when the sufferings are intolerable, and when the patient desires it although informed of the inconveniences of an artificial anus.

Prognosis.—*Results of operation.*—In several cases, the first of which was reported by Franke in 1891, complete cure has been obtained by operation, but sometimes after a long period of relief the attacks have recurred. Gant considers that colostomy hastens cure by (*a*) facilitating

the emptying of the bowel and avoiding constipation; (*b*) Making it possible to keep the intestine thoroughly clean with irrigation, and to apply suitable lotions.

Without operation.—In many cases recovery occurs without treatment, or after internal or local treatment. The affection is not associated with any serious complications.

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EMBOLUS AND THROMBOSIS OF THE MESENTERIC VESSELS.

ETIOLOGY.—Embolus of the mesenteric arteries is as a rule associated with endocarditis or thrombus formation in the heart. Thrombosis of the arteries occurs in connection with atheromatous changes. Thrombosis of the mesenteric veins may be the result of any of the conditions which cause thrombosis in the portal system. The affection occurs as a rule in middle and advanced age.

PATHOLOGICAL ANATOMY.—Embolus occurs more frequently in the superior mesenteric artery than in the inferior, the proportions in 86 cases being 77 : 9 (Neutra). The block may be partial or complete. The portion of bowel and mesentery supplied by the obliterated vessel is engorged and infiltrated with blood, and there is blood also in the bowel. If the condition persists, more or less extensive necrosis of the intestinal wall results. The anatomical changes are the same in thrombosis of the veins as in embolus of the arteries. Sometimes obliterating endarteritis is the cause of embolic or thrombotic ulcers of the intestine.

CLINICAL COURSE.—In many cases the affection begins

suddenly, with colic-like pains, which may be either diffuse or localized; vomiting and diarrhœa follow, and the stools later contain blood. The amount of blood passed is often very large, and the general signs of severe hæmorrhage are then present. After an interval of one to two days the abdomen becomes tender, the pain increases, and fluid is found in the peritoneal cavity, all the signs of peritonitis developing. In other cases the signs of acute bowel obstruction predominate: neither fæces nor flatus are passed; vomiting is repeated, at first of stomach contents, then blood, and then fæces. The clinical phenomena of arterial and of venous obstruction are identical.

Diagnosis.—The occurrence of hæmorrhage from the bowel which has no other obvious cause, in a patient who has some condition which leads to embolism, such as endarteritis, has in many cases led to correct diagnosis. This will be particularly confident if there are signs of embolism in other organs, and if intense abdominal pain accompanies or precedes the hæmorrhage. The temperature is low. In one of my cases the abdominal symptoms were preceded by embolism of the artery of the sylvian fossa and of one radial artery; in another case there were signs of splenic and renal embolism. If symptoms of peritonitis develop, the diagnosis is still further supported.

In atypical cases there may be great difficulties. If there is no hæmorrhage it may be impossible to exclude acute intestinal obstruction from internal hernia, volvulus, and other causes. In intussusception the onset is usually not so extremely acute; and a tumour is usually palpable. Gall-stone obstruction is associated with a history of long-continued antecedent colic.

In the early stages of hepatic cirrhosis there is often hæmorrhage from the bowel, but there is no pain.

INDICATIONS FOR OPERATION.

Some authors advise operation as early as possible, and either resection or the formation of an artificial anus. Most of the cases operated on (under mistaken diagnosis) have, however, terminated fatally soon after, so that actual experience points to the inadvisability of recommending operation if the diagnosis is definite. There is a chance,

even though only a small one, that the process may recover spontaneously. Also the affection usually occurs in individuals who are wholly unequal to the strain of a serious operation. In only a very small number of cases has operation been followed by good results.

PROGNOSIS.—*Without operation.* The acute cases usually end fatally in the course of a few hours or days; other cases run a subacute or chronic course, and the fatal termination may be delayed for several weeks. In some cases, when only the branches are blocked and not the main mesenteric artery, recovery follows. Of 120 cases collected by Neutra, 12 recovered and 108 died. The following case of recovery came under my own observation.

A man, aged twenty-three, developed signs of endocarditis after an attack of articular rheumatism. There was a systolic bruit at the apex, and the second sound was reduplicated. The temperature was high. Enlargement of the spleen developed suddenly, and then diarrhœa with tenesmus. One stool contained a large quantity of blood and mucus, and there was great abdominal pain, without meteorism or ascites. On the next day there was tenderness on pressure over the left lower part of the abdomen, particularly between the navel and the left anterior superior spine. Diagnosis: embolus of the inferior mesenteric artery. Some days later there were signs of embolic infarct of the left kidney. All the symptoms gradually improved except the heart condition, which remained unchanged.

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HÆMORRHOIDS.

Etiology.—The most important etiological factors of hæmorrhoids are habitual constipation, general venous stasis from diseases of the heart, lungs, and liver, and local stasis from affections of the pelvic organs. Men are more frequently affected than women, especially middle-aged men with sedentary occupations.

Pathological Anatomy.—The condition is one of varicosity of the hæmorrhoidal veins. External and internal hæmorrhoids are distinguished, but the anatomical difference is only one of covering, the former being covered by the skin of the anal canal, the latter by mucous membrane.

Clinical Signs.—External hæmorrhoids cause little trouble beyond itching; they may attain the size of a hazel nut and have a broad base. If inflammatory thrombosis takes place, there is great pain and sensation as of a foreign body, and the nodes become tense and firm to the touch. The attack of phlebitis either subsides in a few days, or suppuration takes place and may eventuate in an ulcer or a fissure. Internal hæmorrhoids are sometimes single, sometimes arranged circularly in one or more groups. They frequently bleed; this may take place either after or independently of defæcation, and may be profuse and persistent. Hæmorrhoids often prolapse through the anus, and may become strangulated; the pain then is intense, is associated with fever, and sometimes with retention of urine, and even symptoms of intestinal obstruction. The attack often ends in gangrene, and abscess and fistula may result. Rectal catarrh, with excessive discharge of mucus and tenesmus, usually accompanies such an attack.

Diagnosis.—Simple inspection reveals the presence of external and also of prolapsed internal hæmorrhoids; if not prolapsed, the latter are discoverable by palpation and the use of the speculum. Without proper examination internal hæmorrhoids may be confounded with carcinoma, rectal polypi, and syphilitic, gonorrhœal, or tuberculous ulceration. In dysentery there is tenesmus, and blood in the motions, as in hæmorrhoids, but the blood is more or less altered, and there are tissue fragments also in the fæces. In chronic rectal catarrh without hæmorrhoids there is no blood passed.

INDICATIONS FOR OPERATION.

External hæmorrhoids require operation if they are a continual source of trouble from inflammatory attacks, fissure, eczema, etc. The suppurative complications must be treated by incision, and fissures which do not yield to treatment with ointment require forcible dilatation of the sphincter and incision.

Internal hæmorrhoids call for radical operation when they occasion repeated and considerable loss of blood, when they easily and often become prolapsed and are difficult to reduce or irreducible, and when they become inflamed or give rise to pain in defæcation. There cannot be said to be any contra-indication to operation. The operations practised to-day are free from risk. The patient is often unable to pass water for a day or so, and the first evacuations are painful. Cicatricial narrowing of the anus is very rare, but it has occasionally been recorded after radical excision, which is also usually associated with a considerable loss of blood. The results of operation are good ; the percentage of unsuccessful cases only reaches 2 to 3 per cent.

PROGNOSIS.—*Without operation.*—Prolonged hæmorrhage may give rise to serious symptoms and even prove fatal. A case under my own observation was brought to hospital moribund, and the autopsy showed the cause of death to be hæmorrhage from an internal hæmorrhoid. As already stated, hæmorrhoids are often complicated by suppurative inflammation, fissures, and fistulæ. Deep-seated periproctitis and proctitis are also common sequelæ, and not uncommonly a troublesome eczema.

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PROCTITIS.

Etiology.—Common causes of proctitis are constipation and impaction of fæces, irritating enemata, foreign bodies, and oxyurides. The disease may also arise from a gonorrhœal, syphilitic, or dysenteric infection, and as a complication of carcinoma and hæmorrhoids.

Pathological Anatomy.—The mucous membrane may simply show catarrhal changes, swelling œdema, and hyperæmia, or there may be ulceration, sometimes very extensive. Not infrequently infection spreads to the cellular tissue around, and a purulent periproctitis results.

Clinical Course.—In catarrhal proctitis the stools are frequent and often fluid; there is tenesmus and also pain in the intervals between the stools. A considerable quantity of mucus is passed, and often pus and blood also. The rectum is extremely tender to digital exploration. In many instances the patient also suffers from retention of urine and strangury. After the condition has continued for some time there may be some inefficiency of the sphincter. Fever and general weakness usually accompany the attack, which varies in severity and acuteness.

Diagnosis.—The signs and symptoms enumerated should be sufficient for a diagnosis, together with a careful digital exploration, and in some cases examination with the speculum.

Inspection differentiates the condition from hæmorrhoids and anal fissure; in carcinoma the mucous membrane is felt to be infiltrated with firm growth; in tuberculous ulceration greyish nodules are seen at the margins of the ulcers, and the discharge contains tubercle bacilli. The history will distinguish an attack of acute dysentery. Tabetic crises are recognized by the presence of other tabetic symptoms.

INDICATIONS FOR OPERATION.

In acute proctitis operative treatment is only necessary when there is some complicating purulent process (peri-

proctitis), or when the rectal inflammation is secondary to some other condition which requires operation. In chronic proctitis operation has in some cases been undertaken to give the inflamed canal complete rest by means of colotomy. This is unnecessary until other therapeutic measures have been tried and failed, and unless the symptoms are intolerably distressing. Operation therefore should be considered rather as a last resource. Stricture sometimes follows proctitis, and if this cannot be satisfactorily treated by bougies, operation is called for.

Prognosis.—In a not inconsiderable number of cases the rest provided by a colostomy is successful in bringing about cure. The operation is not of course a severe one, but not entirely free from risk. Without operation chronic proctitis often proves very obstinate. In some cases it leads to paresis of the sphincter, prolapse of the rectum, cicatricial stricture, periproctitis, or hæmorrhoids.

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CHAPTER XV.

Diseases of the Intestines

(*continued*).

Chapter XV.

DISEASES OF THE INTESTINES (contd.).

INTESTINAL STRICTURE.

Etiology and Pathological Anatomy.—Intestinal stricture is caused by a variety of processes; by cicatricial contraction after ulceration of a tuberculous, dysenteric, catarrhal, or syphilitic nature; by torsion of the small or large bowel without complete obstruction; by internal herniation into a peritoneal recess; by kinking following the formation of adhesions. Progressive obstruction by scybala, by gall-stones, and by chronic invagination dependent on tumours, are considered elsewhere.

In all cases of chronic intestinal stricture the bowel below the stenosis is empty, while above it is distended, though rarely to an extreme extent when there is no acute obstruction. Above the stenosis the muscular wall is hypertrophied, the mucosa and submucosa inflamed and often ulcerated (the distension ulceration of Kocher). This complication may lead to secondary peritonitis, diffuse or localized.

Clinical Course.—Patients with stricture of the colon and rectum as a rule exhibit as the first symptom chronic constipation, which becomes more and more rebellious and is accompanied by a sensation of fullness in the abdomen. Sometimes the constipation is replaced by diarrhœa for a short period, reappearing afresh and in an aggravated form. There are, however, cases of stricture of the large bowel who complain of no irregularity in the motions.

In stricture of the small bowel, the stage of constipation is often absent. In stricture in this situation, as also in stricture of the colon, there occur attacks of colic, and this may be the first symptom. The pain is intense during the attack, passes off with gurgling, is often referred

to the same spot, and usually accompanied by nausea, and sometimes vomiting. If an attack lasts for some time, the patient during its presence passes neither flatus nor fæces. The most characteristic sign accompanying the attacks is exaggerated peristalsis; the intestinal coils are observable through the parietes, and are palpable and firm to the touch, owing to the tetanic contraction of their muscular fibres. This intestinal spasm persists from a few seconds to a minute or two, and then passes off, to recur later.

Sometimes the interval between two attacks is long, even several weeks, but this is in the early stage of the stenosis, and as time goes on the period of exemption becomes shorter, until finally the pains are never entirely absent, the abdomen is persistently distended, and the spasmodic seizures occur several times a day.

There is often mucus in the stools, and chronic diarrhœa is not unusual. In some forms of stricture, pus and blood are also present in the motions, that is to say in strictures due to new growth, invagination, and dysenteric ulceration; in other types these are usually absent.

Splashing, and even a metallic percussion note, can often be elicited over the distended bowel above the stricture.

Diagnosis.—If attacks of colic occur from time to time, accompanied by visible and palpable spasmodic contracture of the bowel, if the spasm passes off to the accompaniment of borborygmi, and if the history is suggestive of intestinal stenosis, then a diagnosis of "intestinal stricture from organic lesion" will be made. If the stricture is in the rectum the diagnosis will be made by palpation. The form of the motions is not characteristic in bowel stricture; ribbon-like stools may be passed without any anatomical stenosis; blood, pus, and mucus, if present, will aid the diagnosis. Discrimination must be exercised with regard to the interpretation of constipation; when due to stricture its onset is somewhat sudden, there is an absence of other ascertainable cause, such as neurasthenia, change in habits of life, or diet, preceding acute intestinal catarrh, etc., and it is associated with anæmia, general weakness, and wasting.

The diagnosis may be aided by a history of some antecedent condition liable to cause stenosis, such as

parametritis, cholecystitis, local or general peritonitis, appendicitis, or a reduced hernia, or some bowel affection liable to be followed by stricture, such as tuberculosis, dysentery, and syphilis.

With regard to the diagnosis of the site of the stenosis, distension of the upper part of the abdomen and of the flanks points to obstruction low in the colon, i.e., in the pelvic colon. Distension of the right flank only points to a situation high in the colon. The distended and hypertrophied colon is distinguished from small bowel by its size. In stricture of the small intestine the centre of the abdomen is distended and the flanks are empty, and abnormal peristalsis of small coils lying parallel to one another is often seen. Percussion similarly will aid in localizing the seat of obstruction and demonstrating the distended bowel above it by a highly resonant metallic note.

Peristalsis and intestinal spasm often indicate the position of the obstruction, but only so at the commencement of an attack; after the state of spasm has existed for some days it diffuses from its point of commencement and extends elsewhere.

Regarding the anatomical nature of the lesion, the following facts should be noted. If there is a hernia of old standing, a connection between it and the intestinal stenosis must be considered probable unless some other cause is plainly present (Nothnagel). If there is a history pointing to gall-stones, gall-stone ileus will be suspected. An acute onset in a previously healthy patient suggests a twist, in children under the age of ten intussusception. If fever develops during the first few hours of illness, acute peritonitis will be suspected.

Differential Diagnosis.—From meteorism from other causes, and from affections with violent peristalsis without anatomical obstruction, intestinal stricture is distinguished by the very pronounced and repeated colic, with spasm of the distended coils. Sometimes there is a possibility of mistaking the dilated coils filled with liquid and gas for ascites, seeing that change of position may produce a very marked change in percussion note. I have myself diagnosed ascites and intestinal stenosis in a case in which operation showed no free fluid in the peritoneal cavity. In such cases, according to Nothnagel, the production of splashing

by rapid percussion of an area giving a dull note shows the presence of fluid within bowel.

INDICATIONS FOR OPERATION.

If the clinical signs point definitely to the presence of a chronic or acute bowel stenosis, and if the symptoms (colic, with painful spasmodic contractions) indicate an anatomical stenosis, there is a strict indication for operative interference. This is true whatever the cause of the stenosis may appear to be. Fæcal obstruction alone, with its consequences, requires no operation.

In suspected gall-stone ileus it is often justifiable to temporize. The time for operation is as soon as the diagnosis is definitely made; after this temporizing does not alter the indications, and a risk is run of the onset of acute intestinal obstruction, when the prognosis of operation will be much worse. The operations practised are: exclusion of the stenosis by entero-anastomosis between the coils above and below; resection, particularly in the case of tumours and intussusceptions; reposition of the bowel in volvulus; freeing of the gut in kinking by adhesions. If the obstacle cannot be removed or short circuited, an artificial anus is necessary.

Contra-indications.—If the general condition is bad in consequence of some other complicating affection, and the intestinal stricture is causing symptoms of a comparatively slight degree of severity, then the patient may be advised against operation if the complication is one that will necessarily prove fatal. A bad general condition in itself is no contra-indication, as in the worst cases an artificial anus may be established under local anæsthesia.

If the chronic obstruction is due to fæcal impaction, operation is not necessary, as this can be dealt with by non-operative measures. If definite diffuse peritonitis is present, along with signs, symptoms, and history pointing to stenosis, operation will almost certainly be soon followed by death, and is therefore as a rule not to be advised.

Prognosis.—*Of operation.*—In many cases a successful operation is followed by permanent relief, particularly in the case of entero-anastomosis for benign strictures and the separation of adhesions causing kinking. The colic as a rule disappears entirely, but sometimes not until a

considerable interval has elapsed; in all cases it is much relieved at once. If an artificial anus is necessary, this is of course very troublesome to the patient and his *entourage*. The risks of operation vary with the procedure, in the order—establishment of an artificial anus, entero-anastomosis, resection.

Without operation.—Without operation the patient gradually gets worse. The prognosis as to time varies according to the cause of the stenosis and the secondary changes in the bowel. A case of simple cicatricial stricture will live longer than a case where the stenosis is due to new growth. Sudden dangerous complications are not uncommon, particularly the onset of acute obstruction. A stricture which is not very narrow may be blocked by a fæcal mass or a fruit-stone. After the stricture has been present for some time distension ulcers tend to develop above it, and perforation may occur; there then develops either acute diffuse peritonitis or an encysted peritonitis, with fæcal abscess and its associated risks.

LITERATURE.

Vide—Intestinal Obstruction.

INTESTINAL OBSTRUCTION.

Intestinal obstruction, or ileus (Schlange) may be produced by a variety of different anatomical lesions which all give rise to a certain group of symptoms, of which the following are the most important: pain in the abdomen, constipation, vomiting at first bilious and then fæcal, and meteorism.

Dynamic obstruction, the result of paralysis of the intestinal muscular wall, is to be distinguished from mechanical obstruction due to some mechanical cause. Cases of mechanical obstruction are further divided into those in which there is strangulation and those in which there is obturation without strangulation. In strangulation the bowel wall suffers damage owing to interference with its circulation; in obturation the lumen of the bowel is obliterated by some agent either within or without the channel, and there is no primary damage to the bowel itself.

Etiology and Anatomy.—Obstruction from paralysis of the gut is most commonly the consequence of acute

peritonitis, but in some cases the paralysis is due to mechanical injury to the bowel, as for example after an extensive abdominal operation, or when a portion of strangulated bowel, although replaced, is unable to resume its functions. Intestinal paralysis from toxic infection is uncommon.

Strangulation may occur in a variety of ways. Bowel may be caught by peritoneal adhesions, or by an adherent appendix or a Meckel's diverticulum, or may be herniated and strangulated through the diaphragm or in one of the abdominal fossæ, the fossa duodenojejunalis for example. The ileum is usually the part involved under these circumstances. Volvulus, that is to say axial torsion of bowel, is particularly common in the pelvic colon; the twisted bowel is strangulated as the torsion interferes with its circulation. A long pelvic colon and a long mesentery predispose to the accident, and injury or constipation may lead up to it.

Intestinal obturation may be due to new growths, to kinking by peritoneal adhesions, or to cicatricial stricture following ulceration (tuberculosis). Tumours of neighbouring organs may obstruct the bowel by compression. Gallstones, fæcal masses, and other foreign bodies may also cause the condition. Intussusception is another cause which is considered in a special chapter.

In all these different types of obstruction, if unrelieved, peritonitis supervenes and is the usual cause of death. In the distended bowel above the obstruction, ulceration occurs after the obstruction has persisted for some time.

1. Intestinal Paralysis (dynamic ileus).

Clinical Course.—When intestinal paralysis follows peritonitis the distension of the bowel is usually very great. The amount of distension varies with the extent of the peritonitis. In the acute diffuse form the distension is extreme; in the acute circumscribed the meteorism is slight and localized and the intestinal movements are not completely abolished. In acute diffuse peritonitis there is general tenderness on pressure, the abdomen is barrel-shaped, and the distension is uniform. The temperature is often, but by no means always, raised. By examining the abdomen in different postures, free fluid is usually to be detected early.

Diagnosis.—If the group of symptoms mentioned above is present, if the abdomen is distended and tender to pressure, and if there are signs of free fluid in the peritoneal cavity, then the diagnosis of paralytic obstruction is clear; if the abdomen is equally distended and the tenderness is diffuse, the condition is one of general peritonitis. The starting point of the infection can at this stage be usually judged only from the history, in which there may be points suggesting cholecystitis, or appendicitis, or some affection of the female genital organs, as the original focus.

From obstruction due to strangulation, paralytic ileus is distinguished by the inequality of the distension in strangulation, and the fact that the outline of a single greatly distended coil of bowel can usually be recognized. In obstruction from stricture the distension is also unequal, abnormal peristalsis can be made out, and the bowel above the stricture can be felt rigid and hypertrophied. The indications for operation in this condition of paralytic obstruction are discussed in the article on peritonitis.

2. Strangulation (strangulation-ileus).

Clinical Course.—The onset is usually sudden, with acute pain, often collapse, and vomiting of bilious matter. After a short time the intestinal functions are entirely suspended, and neither fæces nor flatus are passed, but just at first fæces in small amount may be got rid of. Soon the contour of a distended bowel coil can be made out, remaining absolutely immobile and not tender to pressure. Even in the cases of patients with thick abdominal walls this coil can often be discovered by palpation. Early effusion into the peritoneal cavity is usual. In volvulus of the pelvic colon a small quantity of water only ($\frac{1}{4}$ to $\frac{1}{2}$ litre) can be passed per anum; in volvulus of the small bowel this sign is not present.

Diagnosis.—The mode of onset and the discovery of a largely distended bowel coil often enables a diagnosis to be made. Sometimes the diagnosis becomes certain when a distended coil of small bowel can be made out which cannot be easily displaced upwards, and which extends from the pelvis towards the upper parts of the abdomen; and in other cases the impossibility of passing any considerable amount of fluid per anum clears up the diagnosis. If chronic

intestinal disturbance has followed the reduction of a hernia, and if symptoms of obstruction supervene suddenly, the obstruction will be suspected at the site of the previous hernia.

Examination of the usual hernial orifices will exclude strangulation of an external hernia, and the absence of forcible peristalsis will exclude obstruction by stricture.

In general peritonitis there is universal intestinal paralysis; in local peritonitis there is local meteorism, local tenderness to pressure, often fever, and seldom fæcal vomiting. The history must be relied upon, along with the symptoms, to exclude biliary and renal colic. In some cases the differential diagnosis is very difficult : the two following cases illustrate this :—

An advocate, aged fifty-four, who had suffered from heart disease for several years, had for a year and a half had attacks of constipation, with much pain and collapse. The attacks had become more frequent, though not more serious. The first occasion on which I saw the patient he was collapsed, complained of nausea, and had a small, running pulse. Some hours previously pain had come on suddenly and acutely in the left lower portion of the abdomen. He passed neither flatus nor fæces on this day nor the two following, and vomited repeatedly. I found a large distended coil of bowel, which seemed to correspond to the transverse colon. Rectal irrigation with large quantities of water was possible ; there was no abnormal peristalsis, and the hernial orifices were free. As he had previously suffered from uraturia from time to time, renal calculus was thought of, in spite of the absence of other signs of renal colic. On the second day fragments of red cells were found in the urine, and on the third he passed a renal stone and was at once relieved of all his obstruction symptoms.

A woman, aged 48, was brought to hospital with a diagnosis of subacute nephritis and commencing uræmia. She was collapsed, almost pulseless, but conscious, and complained of acute pain in the neighbourhood of the right costal arch. Vomiting was incessant. During the following days the amount of urine was from 500 to 800 grams, neither flatus nor fæces were passed, the vomiting persisted, increasing distension was noticed in a coil of

intestine in the right lumbar region ; no abnormal peristalsis, and no tenderness on pressure. The pain had commenced suddenly two days before admission. In view of a commencing pneumonia, cardiac weakness, and the renal disease, no operation was deemed advisable. At the autopsy a thick omental band was found strangulating the colon in the region of the hepatic flexure, and there was also secondary peritonitis.

INDICATIONS FOR OPERATION.

When a diagnosis of intestinal strangulation is made, operation is advisable at once, whether the site of strangulation can be determined or not. If, therefore, symptoms of obstruction are present, and a large distended coil of bowel is found, immovable, or showing only slight peristaltic movement, then laparotomy should be done forthwith. If pain, vomiting, and absolute constipation are present, but no distended intestinal coil can be discovered, it is justifiable in some cases to temporize until the second day ; but if the symptoms still persist, an exploratory laparotomy must then be done. In every case the pulse and the general condition must be carefully watched, and the onset of the collapse must be anticipated by operation. The impossibility of passing a considerable quantity per anum indicates immediate operation. If initial serious symptoms improve during the subsequent forty-eight hours, if the pulse becomes stronger and less rapid, and the collapse, vomiting, and pain diminish, and particularly if some flatus or fæces are passed, it is well to temporize, and operate only if the symptoms relapse.

If when the patient is first seen the abdomen is already much distended, but there are definite signs of slight peristaltic movement (some coils of intestine being palpable) and no considerable degree of ascites : operation is indicated if the history—sudden onset with severe pain when the patient was in ordinary health, and the absence of physical signs indicative of any inflammatory focus in the abdominal cavity (appendix, pelvic organs)—points to obstruction from intestinal strangulation rather than peritonitis.

The object of operation is to free the involved bowel by the section of constricting bands, the restoration of volvulus, etc. When there is great distension the coils are often

emptied by puncture. Resection of bowel is only done when the bowel is so altered by the strangulation that its recovery is considered doubtful.

If there be pronounced collapse and signs of general peritonitis in a patient who has had symptoms of acute intestinal obstruction for several days, operation is contra-indicated. Initial collapse is not against operation, and if operation be not done in such a case it will probably soon end fatally.

Prognosis. — *Of operation.* — Successful operation is followed immediately by disappearance of the symptoms, cessation of vomiting, passage of flatus, and complete recovery. The earlier the operation the better the result.

Gangrenous bowel may rupture during the operation and acute septic peritonitis be set up. The same danger attends resection of bowel. Sometimes an artificial anus has to be established, with all its consequent inconveniences. Operative shock must be guarded against.

Without operation.—In the great majority of cases left without operation general peritonitis sets in and is fatal. Cases of recovery from symptoms of apparent strangulation are recorded, but are to be regarded only as curiosities.

3. Occlusion (obturation-ileus).

Clinical Course.—The onset of acute obstruction in this condition is usually preceded by the symptoms of stenosis described on p. 227. After such symptoms have been present for some time, total obstruction supervenes, with incessant vomiting, eventually fæcal, a rapid pulse of low tension, and pains in the abdomen. Finally in such a case signs of peritonitis appear, and the patient collapses and dies.

Diagnosis.—When there is a history of the symptoms of intestinal stenosis the cause of the acute obstruction is clear.

With regard to the actual cause of obstruction, earlier symptoms of intestinal ulceration will point to cicatricial stricture. Tubercular lesions elsewhere, and the presence of a mass in the ileocæcal region, will suggest a tubercular process. Rectal or vaginal examination may reveal a pelvic tumour, and a history of the passage of blood and mucus by the bowel will make one suspect a new growth.

A scar the result of injury or suppuration will point to the probability of kinking by peritoneal adhesions. The passage of blood and mucus by the bowel in a young child, associated with a cylindrical shaped tumour in the abdomen, vomiting, and distension, is in favour of intussusception.

A history of gall-stone colic will suggest that the obstruction is due to a calculus in the bowel.

Rectal examination and the discovery of large, hard fæcal masses will differentiate obstruction from fæcal impaction.

The diagnosis of the seat of obstruction is discussed in the section on intestinal stenosis.

From strangulation a diagnosis is to be made by the presence of forcible peristaltic movements and hypertrophied bowel. In peritonitis the bowel is paralyzed and the abdomen is tender to pressure, whereas, in obstruction from intestinal occlusion, pressure on the abdomen rather relieves the pain.

Exaggerated intestinal peristalsis should be sufficient to distinguish the condition from gall-stone or renal colic.

INDICATIONS FOR OPERATION.

If the clinical signs definitely point to obstruction by occlusion, operation is called for unconditionally: (*a*) In all cases in which the condition has developed progressively, with exaggerated peristalsis and meteorism, even if flatus and fæces are occasionally passed; (*b*) In all cases of *acute* intestinal obstruction. When the latter is apparently due to an impacted gall-stone, operation should be undertaken if the serious symptoms do not clear up in a few hours, or if symptoms of moderate intensity go on increasing in severity.

When the diagnosis is intussusception, operation becomes necessary when other means have failed.

In doubtful cases (colic, etc.) operation is to be recommended when the symptoms do not improve in spite of medicine and other non-surgical measures.

In cases which have a long history of symptoms of stenosis increasing in severity, operation must not be delayed if the general condition begins to decline, if the pulse previously normal becomes more rapid and feeble, if vomiting becomes more and more frequent and of a

bilious and perhaps slightly fæcal type, or, finally, if the meteorism becomes so marked that some intestinal coils give a metallic percussion note. Increasing vehemence and frequency of the colic, and the involvement of an increasing extent of the bowel in the forcible peristalsis, are also signs which militate against delay. The pulse is the most important guide of all.

In general, it may be said that in intestinal obstruction a good general condition and a pulse of sustained quality alone justify delay, and that never beyond the second day of symptoms.

According to the condition of the patient and the cause of the obstruction, the surgeon may choose to either establish an artificial anus (in the worst cases under local anæsthesia), or perform an entero-anastomosis excluding the obstruction, or resect the bowel.

Contra-indications.—If rectal examination shows the presence of large masses of fæces in the rectum, and the symptoms are compatible with obstruction from impacted fæces, the rectum must be cleared out and no operation undertaken unless the symptoms persist. In the course of a few months I saw two cases presenting all the symptoms of intestinal obstruction from occlusion, in which complete recovery followed the manual removal of enormous masses of fæces from the rectum. A bad general condition hardly ever contra-indicates operation, as in the worst cases an enterostomy can be performed under local anæsthesia.

Immediate operation is not advisable if the condition of the heart is still good and the diagnosis uncertain, but if the symptoms become clearer, and if the pulse begins to fail, it is necessary to intervene surgically.

Prognosis. — *Of operation.* — The symptoms subside when the operation is successful, but whether the success is permanent or not depends upon the cause of the occlusion. In tuberculosis other strictures may develop; in malignant growths complete removal may be impossible; in other conditions—kinking by adhesions, intussusception, and simple stricture—the relief is permanent.

The risk of operation varies very much according to the actual operation performed. A simple enterostomy is attended by no more risk than that of a simple opening into the peritoneal cavity; entero-anastomosis is more dangerous,

particularly if it involves the large bowel. Resection of bowel is attended by the highest mortality of all.

The risk from shock depends upon the length and extent of the operation and the amount of exposure of the bowel. An extensive operation may be followed by some paralysis of the gut. In some cases damaged bowel has ruptured in the course of operation, and fatal peritonitis resulted. If the obstruction cannot be removed, a permanent artificial anus is necessary. After entero-anastomosis it is often some time before the abdominal pains completely disappear, so much so that a return of obstruction may be suspected ; as a rule they disappear entirely later. Ventral hernia can usually be avoided.

Without operation.—Peritonitis supervenes sooner or later, with or without perforation of the gut. In a few exceptional cases recovery has taken place without surgical intervention. According to Nothnagel this is most common in cases of intussusception, of obstruction by gall-stones, foreign bodies, and fæcal masses, and in chronic obstruction suddenly becoming acute ; less common in volvulus, and internal incarceration and kinking of the bowel.

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INTUSSUSCEPTION.

Etiology.—Intussusception is most common in children under the age of four, and particularly common in the first year. In infants it is usually due to intestinal disturbances, colic and diarrhœa; it is also caused by polypi and other intestinal new growths.

Pathological Anatomy.—The invagination is solitary in most instances, and descending, that is to say, the intussusceptum advances anal-wards. Several anatomical types are distinguished: the ileocæcal, which is the most common, the enteric, the colic. In the ileocæcal form the ileocæcal valve forms the apex of the intussusceptum. The mesenteric attachments cause the intussusceptum to assume a concave outline, the concavity towards the attachments. The mesentery being compressed, the circulation of the gut is interfered with, and hyperæmia and œdema of the intussusceptum ollow, and hæmorrhages also take place from and into it. If the circulatory block is acute, gangrene may follow, and the gangrenous intussusceptum may be passed. If adhesions give way when an intussusceptum becomes gangrenous and separates, diffuse perforation peritonitis results. In chronic intussusception the bowel above is dilated and hypertrophied. Local peritonitis is common in the course of chronic intussusception.

Clinical Course.—The onset is usually sudden and associated with very acute griping pains. There is often an initial attack of vomiting, and an evacuation of the bowels. The passage of material by the bowel continues, and the stools consist chiefly, and after a time entirely, of mucus and blood, the child often having marked tenesmus. If the condition runs an acute course, general collapse sets in within the first day, and the vomiting becomes fæcal. A firm cylindrical swelling can be felt on abdominal palpation, its extent and position varying according to the length of time that has elapsed since the onset.

In the cases where the course is chronic, the symptoms are those of intestinal stenosis, the pains are not excessive, and as a rule there is no bloody diarrhœa. An abdominal tumour is recognizable in these cases also. In some cases the intussusceptum has actually prolapsed through the anus.

Diagnosis.—If the symptoms described are present—sudden pain, vomiting, tenesmus, blood and mucus in the stools, no passage of fæces and flatus, distension, and abdominal tumour—the diagnosis of acute intussusception is definite. The tumour is the most important sign in the diagnosis of chronic intussusception, which has to be diagnosed from other forms of subacute and chronic intestinal stenosis.

The acute form is distinguished from other forms of intestinal strangulation by the passage of blood and mucus by the bowel, and from acute obstruction supervening on chronic stenosis by the history of symptoms of the latter. In every case the presence or absence of the characteristic tumour is of much aid in diagnosis, although in early cases it may be impossible to feel it without an anæsthetic.

INDICATIONS FOR OPERATION.

If the diagnosis is clear and the symptoms are acute, and medical treatment has proved useless, operation should be undertaken as early as possible. It will consist in either disinvagination or resection.

The more acute the symptoms, the earlier fæcal vomiting begins and the heart begins to fail, the more urgent is the operation, which should be done within twenty-four hours whenever possible. A pulse which soon becomes very rapid and loses tension is the strongest argument against delay.

When the onset is less acute and the symptoms chronic or subacute, then a more lengthy delay is justified, and during this time the "bloodless" methods of reposition must be tried. If these prove useless and the symptoms persist, the abdomen must be opened and the condition dealt with according to the state of affairs which is found present. In the chronic type of the affection, as well as in the acute, the pulse should be watched and any signs of heart failure interpreted as a call for operation.

The age of the child does not influence the question of

operation; there should be no hesitation in operating on the young infant when the symptoms call for it.

In subacute cases operation is not entirely justified, at any rate during the early stage of the disease, and if the general condition is good, until insufflation or water distension has been tried.

Prognosis.—*Of operation.*—The earlier the operation the greater is the probability of successful manual reduction, which is only possible so long as no marked peritoneal adhesions have formed. If resection is necessary the chances of success are much lessened, although a considerable number of recoveries are on record. During the course of operation the bowel may tear. Recovery by operation is relatively uncommon under the age of two years; the chief risk in infants is shock. According to Wichmann, in children under one year the percentage recovery by operation is 17; between the ages of 1 and 10, 28 per cent; above the age of 10, about 42 per cent. Return of invagination after reduction by laparotomy is very rare.

Without operation.—Occasionally the course is ultra-acute, and death takes place within twenty-four hours, but this is exceptional. The ordinary acute case has a course of some eight days as a rule; the mortality in children is about 80 per cent. In the subacute and chronic cases the chances of recovery without operation are better, but not much. In the acute cases death is the result of shock or collapse from the acute obstruction. In the chronic cases peritonitis is the usual actual cause of fatality. Spontaneous recovery by sloughing of the intussusceptum is very unusual in children in the first year, less uncommon in older patients. Occasionally spontaneous disinvagination has taken place even when the condition has been present for some weeks.

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INTESTINAL CANCER.

Intestinal cancer is much more common in the male than in the female. Most patients are between 40 and 60. The disease is almost always primary.

Pathological Anatomy.—Carcinoma of the intestine is usually solitary, occasionally multiple. In at least half the cases the seat is the rectum, the large intestine coming next, and the small intestine last. In only 5·6 per cent of cases does the disease occur in the latter. In the large intestine the cæcum and the pelvic colon are the most common situations, then the hepatic and splenic flexures.

The disease is usually a cylindrical-celled cancer; it extends around the bowel and gradually causes stenosis, with the usual dilatation and hypertrophy of the bowel above. Ulceration is common, causing hæmorrhage and discharge; an ulcer may perforate into the abdominal cavity or a neighbouring organ, or the exterior. Perforation into a neighbouring coil of bowel is not unusual.

Clinical Course.—There is often a long latent period in cancer of the intestine. The usual sequence of symptoms is as follows: irregularity in the action of the bowels, diarrhœa, or alternating diarrhœa and constipation with intervals of regularity; there is pain during the constipation period; later local abdominal fullness and distension, and abnormal peristalsis, with rigid contraction of a certain segment of bowel; when the attacks become severe, vomiting usually accompanies them. The stenosis symptoms often show marked variations in intensity from time to time. The stage at which the tumour becomes palpable depends upon its anatomical site to a large extent. When palpable

it is often very freely movable, has a nodular outline, and is dull to percussion, and yet not absolutely dull. Blood is often found in the stools: it may be in sufficient quantity to be seen with the naked eye, or may be only discoverable with the microscope. Tenesmus is only present when the growth is in the rectum. Loss of appetite, pallor, and other general symptoms often precede the local symptoms.

In some cases the onset of acute intestinal obstruction is the first definite sign of intestinal cancer. The higher the cancer the more pronounced and violent as a rule are the stenosis symptoms. Ulceration is a more troublesome complication the lower the growth. Perforation may take place into neighbouring organs, e.g., into the bladder in the case of growth in the sigmoid flexure.

Diagnosis.—If the symptoms which have been already described as those of chronic intestinal stenosis (p. 227) are present, if there is loss of appetite, loss of strength and pallor, and if blood is found in the stools, a diagnosis of intestinal neoplasm is generally justifiable, even although there is no palpable tumour. A cancer of the small bowel is extremely mobile, as is also a growth of the transverse colon, to a less degree one of the pelvic colon, while in other situations it is commonly fixed.

There are many conditions which may simulate cancer of the bowel, the most important being tuberculosis and the tuberculous ileocæcal tumour, chronic intussusception, and fæcal impaction. Tumours of other organs may also simulate cancer of the bowel by encroaching on the latter, e.g., tumours of the stomach, gall-bladder, kidney, pancreas, and ovary; in some such cases a confident diagnosis is impossible.

INDICATIONS FOR OPERATION.

If there appears to be a possibility of radically removing a tumour of the bowel, operation is unconditionally indicated. If it is clear that a radical operation is impossible, a palliative operation is only indicated when there are symptoms of marked stenosis or complete obstruction. Radical operation consists in resection in one or two stages. If the bowel above the stenosis is much altered, the two-stage plan gives much the best results.

Palliative operations are: Complete or incomplete

exclusion, simple entero-anastomosis, or the simple formation of an artificial anus. Advanced marasmus is an important contra-indication. If there are signs of metastases, or of encroachment on surroundings, operation will be deemed inadvisable, particularly if symptoms of stenosis or other grave phenomena are absent.

No operation of a palliative nature should be undertaken unless it is clear that some definite relief can be given thereby; wide metastasis, ascites, and other such phenomena contra-indicate interference of all kinds.

PROGNOSIS.—*Results of operation.*—The risk of resection in malignant growths is very high, particularly when the operation is done in one stage; about a third to a half of the cases have succumbed to collapse, peritonitis, and other operation complications. The operation in two stages gives a lower mortality. The mortality of the palliative operations is also high, but varies considerably in the hands of different surgeons. Amongst the drawbacks which may result is the persistence of an artificial anus.

Many operations have been completely successful, with entire and permanent relief to symptoms; palliative operations often prolong life to a marked extent. After entero-anastomosis the patient may live for many months, the average duration of life in Mikulicz's cases being $8\frac{1}{2}$ months. After colostomy the average duration of life is from 10 months to $1\frac{3}{4}$ years, according to different statistics.

The number of radically cured cases recorded in the literature is not large, and the proportion of cures varies much with the different surgeons. Of 12 patients operated on by Mikulicz, 5 were alive and free from recurrence at periods of from 4 to $9\frac{1}{2}$ years after operation. Of 12 of Körte's cases 4 were free from recurrence 4 years after operation. Other operators have published less satisfactory results.

Without operation.—The actual cause of death is not always the same. Sometimes it is acute intestinal obstruction, sometimes cachexia, and in other cases some complication such as perforation, metastasis, etc. The disease is compatible with relatively long life. As a general rule, the nearer the growth is to the anus the longer the patient survives, the exception to this being in the case of

the very malignant rectal cancers. The actual duration from first symptoms to death varies from a few months to six years.

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CANCER OF THE RECTUM.

Cancer of the rectum is much more common in men than in women. Two-thirds of the patients are over 40 years of age, but the affection is not very uncommon in comparatively young individuals.

Pathological Anatomy.—The carcinoma cells are usually of the cylindrical type, and may be either adenomatous or alveolar in arrangement, the latter form being very malignant. Some growths are soft and "medullary," others are hard and "scirrhous"; colloid cancer is common. The central part of the growth usually breaks down early, the growth advancing by its edges. Surgeons distinguish the following anatomical types: (1) The marginal cancers of the lower part of the rectal ampulla, often originating on the anterior wall and soon encroaching on the whole circumference of the bowel; this is the commonest form. (2) The high, fibrous carcinoma, which only involve a short length, and very early extend right round the gut. (3) Diffuse infiltrating carcinoma, involving a great part of the rectum.

In adenocarcinoma the glands are involved in quite an

early stage. The neighbouring organs are often encroached upon as the growth extends. Metastasis takes place through the blood stream as well as through the lymphatic system.

Clinical Course.—The first symptoms are usually those of a catarrh of the rectum, mucus in the stools, tenesmus, the passage of pus and blood, at first in small amounts, but soon more abundantly. In the advanced stages the discharge contains tissue fragments and is very foul smelling.

Stenosis symptoms are hardly ever absent, and often appear early, especially in the high cancers. The first signs are then fullness of the abdomen, dull pains, and alterations in the action of the bowels (diarrhœa, or alternating diarrhœa and constipation); later the colon becomes distended and hypertrophied above the stricture.

General symptoms are often delayed in appearance until the growth has been present for a considerable time, but once established they usually advance very rapidly. When the growth ulcerates there is often some fever, loss of appetite, general weakness, and anæmia from the septic absorption.

When the growth extends to other pelvic structures intense neuralgic pains may be caused by involvement of the nerves, septic cystitis by penetration to the bladder, and fulminating peritonitis by perforation into the peritoneal cavity.

Diagnosis.—A growth accessible to the finger is felt as a hard, nodular mass sharply separable from the soft mucous membrane. A high cancer can sometimes be palpated with the patient standing up, and since such a growth gradually sinks in the pelvis, frequent rectal examination may reveal it when a first examination proves negative; this has been my own experience in several cases. In these high growths the ampulla, which is normally collapsed, is often widely dilated. Generally speaking, the diagnosis is based on the presence of the symptoms above detailed.

Syphilitic and gonorrhœal ulcers of the rectum are soft and superficial, and the edges not infiltrated. Cicatricial strictures are not nodular and tumour-like, the scar is smooth and funnel-shaped. Digital examination will

distinguish cancer from hæmorrhoids, catarrh, and other processes which cause tenesmus and the passage of blood and mucus.

INDICATIONS FOR OPERATION.

In carcinoma that can be removed, resection or amputation of the rectum should be done in as early a stage as possible, as soon in fact as the diagnosis is made, and whether the growth is high up or low down. The absence of metastases is generally looked upon as a condition for this radical operation ; some surgeons, however, undertake it in spite of metastases if the local state is favourable.

In carcinoma that cannot be removed, many authors advise (and I agree) the establishment of an artificial anus when the tenesmus is very pronounced, when the patient passes blood and discharge steadily, and when in spite of purgatives and enemata there is obstinate constipation and considerable meteorism, particularly if there is some fever and septic intoxication. Some authorities (Kraske) only perform colostomy when there are threatenings or actual signs of obstruction.

Contra-indications.—High cancers which are intimately adherent to bladder or to bone are not suitable for radical operation, and many surgeons take the same view with regard to adherent lower growths. The degree of adhesion can only, however, be properly estimated under anæsthesia. Definite metastases in liver, peritoneum, or elsewhere should be looked upon as a bar to radical operation.

Advanced age is no contra-indication. Some English surgeons look upon operation under 40 as useless, owing to early recurrence. In incurable cases colostomy will only be withheld when there are no obstruction symptoms, no severe local symptoms, and no signs of chronic sepsis.

Prognosis.—*Results of operation.*—Permanent cures are not unusual, considering as such, patients who show no recurrence after 3 years. The percentage varies in different statistics, but most surgeons can show more than 15 per cent. In Czerny's 99 cases, 13 were free from return more than 4 years, and 8 more than 5 years after operation. Hochenegg reports 17 per cent permanent recoveries in 174 cases. In incurable cases colostomy usually prolongs life considerably ; of 43 cases of Czerny's, 12 lived more

than a year and 3 months and even up to $3\frac{1}{2}$ years after the operation, and 28 lived from 40 days to $1\frac{1}{2}$ years. The functional results after resection are much better than after amputation of the rectum; in many cases where the sphincter has been retained there has been both permanent recovery and perfect continence. Here again the results vary much in the hands of different surgeons.

When the rectum is amputated and the sphincter removed there is no sort of continence during the first months, but after that there is continence for formed fæces but not for flatus.

Colostomy usually improves the general condition very much; the fever, meteorism and signs of sepsis improve, and the tenesmus and diarrhœa are lessened. Sometimes the patient even puts on weight, and may be able to go about his work.

Risks of operation.—The mortality of the radical operation is high. About 1 case in 5 succumbs. The statistics of Krönlein give a mortality of 19·4 per cent in 881 cases, those of Rave 20 per cent in 335 cases.

The risks are greater in the case of high growths (28 per cent, Rave). A surprising fact is that the perineal operation is less fatal in women than men, the contrary being the case as regards the sacral operation. The causes of death are wound infection, heart failure and collapse, and pulmonary complications.

After amputation the anus is often very troublesome, the incontinence very annoying to the patient. Sometimes after resection a stitch or two give way, and a sacral fæcal fistula forms and requires closure later.

The dangers of colostomy are small, yet Czerny lost 3 cases out of 43. As a rule the artificial anus can be kept under control.

Without operation.—The average length of life in encephaloid cancer is from one to two years. In the case of the scirrhous growths patients have survived as much as 5 years. In young subjects the disease usually runs a rapid course. Great suffering may be caused by metastases in the liver, vertebral column, and other parts.

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CONGENITAL DILATATION OF THE COLON.

This affection is congenital, and more common in boys. The whole colon may be dilated, or only the descending portion. The wall of the dilated bowel is as a rule thickened, rarely thinned; the mucous membrane often shows catarrhal ulcers.

Clinical Course.—The most prominent symptom is constipation, lasting for days and even weeks, appearing in early childhood and even in infants at the breast. The abdomen is distended, and metallic resonance is present over the dilated bowel. Forcible peristalsis is often to be made out, and also elevation of the diaphragm. The rectal ampulla is usually empty. It is often possible to feel the dilated thick-walled bowel through the abdominal parietes.

Diagnosis.—If these symptoms are present, if there is no vomiting, and if it is possible to empty the dilated bowel with a tube passed per anum, if the tube evacuates large quantities of gas and fæcal matter, and the dilated bowel at the same time collapses, the diagnosis is practically certain. A case has been reported where the diagnosis was supported by an X-ray picture after the injection of

an emulsion of bismuth. Stenosis or invagination are excluded by the possibility of evacuating the bowel with purgatives and the rectal tube, and by the absence of vomiting.

INDICATIONS FOR OPERATION.

When treatment by purgatives and the rectal tube produces no improvement in the condition, when the distension of the colon persists and peritonitis or rupture threatens, then operation is called for. Operation is only indicated when the condition appears to threaten life in some way. The least dangerous plan is to establish an artificial anus; by this means improvement but not cure is obtained. Radical operation involving the resection of the affected bowel is an extremely severe procedure considering the usual age of the patient. Operation will not be done until an attempt has been made to relieve the alarming symptoms by other measures. In chronic cases operation should not be advised so long as relief is given by purgatives and the rectal tube.

PROGNOSIS WITHOUT OPERATION.—Most children die very young, but sometimes medical measures have allowed the child to be successfully reared.

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SUBCUTANEOUS INJURIES OF THE STOMACH AND INTESTINE.

The commonest accidents giving rise to injuries of the stomach and bowel are kicks from horses, compression by the wheels of vehicles, or by the fall of earth and such like, and falls on the abdomen.

Pathological Anatomy.—The injury may produce contusion, bursting, or tearing. Lesions may be perforating or non-perforating. Rupture is most common in the case of the jejunum and ileum. The stomach injuries number only one in ten (Petry). The typical seat of a rupture of the stomach is at the lesser curvature of the bowel, at the point opposite to the mesenteric attachment. In small tears, the mucous membrane may completely prevent the escape of contents; large tears, however, gape. In contusion, there are hæmorrhages into the intestinal wall, particularly the submucosa. Slight contusions may recover completely, and even the severe types may cicatrize after exfoliation of the necrosed portions of the mucosa. In the worst contusions, late perforation usually takes place by necrosis of the whole thickness of the wall.

Clinical Course.—Signs of shock appear immediately, whether the lesions are perforating or not. The later symptoms are very vague in non-perforating injuries of the stomach; the usual are vomiting, hæmatemesis or melæna, and pain, symptoms in fact which suggest ulcer. Non-perforating duodenal injuries produce the same symptoms except that vomiting of stomach contents and blood is more unusual. Contusions of the small and large bowel without rupture produce no constant clinical symptoms, at any rate in the early stages. If the injury produces rupture, the shock is preceded or accompanied by agonizing pain at the point of perforation, the abdominal walls are board-like, the breathing is shallow and thoracic, and there is probably vomiting. Free fluid can soon be made out in the abdomen, and gas collects at the highest point. Especially important is the gradual disappearance of the liver dullness. Later, all the symptoms of septic perforation-peritonitis develop.

Diagnosis.—A non-perforating contusion of the digestive tract can only be suspected. It is only when a large mass of necrotic mucous membrane is vomited up or passed per rectum that the diagnosis is clear, and this does not take place earlier than several days after the injury.

Free gas in the peritoneum is a definite sign of perforating injury; apart from this it should always be suspected when the abdominal parietes persistently remain rigid, when the vomiting is frequent and bilious, and when there

is free fluid in the abdominal cavity. Also in favour of perforation are emphysema of the abdominal wall (a rare phenomenon), metallic quality of the heart sounds (also rare), and respiratory sounds which can be heard over the abdomen.

Intra-abdominal hæmorrhage may present the same symptoms as rupture of the stomach or intestine, and gives the signs of an intra-abdominal extravasation. It is distinguished, however, by the phenomena of acute anæmia, pallor, lowness of temperature, small and rapid pulse, and rapid, shallow respiration.

The liver dullness may be masked by meteorism, but free gas is always associated with free fluid in the abdominal cavity, which will prevent error and distinguish between the two conditions.

INDICATIONS FOR OPERATION.

If in a case of injury there is even a probability of perforation of the stomach or intestine, operation is indicated to find the injury and close the opening. The earlier the operation the better the prospect. If there is a commencing general peritonitis, operation is definitely called for, even when two or three days have elapsed since the injury. If an early operation has not been performed, and if the symptoms have remained localized, operation is only indicated when there are definite signs of circumscribed abscess.

Contra-indications.—Operation is contra-indicated during the initial shock, but not by shock present some hours later, as this may be mainly due to a commencing peritonitis. In the case of injury to a stomach known to be empty it is justifiable to wait, but to be ready to operate at the first suggestion of peritonitis. If the time of early operation is passed, with local peritonitis but no signs of generalized peritonitis, it is permissible to temporize and treat the local condition as required.

Prognosis.—Petry states that of 18 cases of rupture of the stomach by injury operated on within 24 hours, 45 per cent recovered; of 24 operated on later, only 25 per cent survived. As has been already said, sometimes a rupture recovers spontaneously, and certainly contusions often do so. But if signs of peritonitis develop, which is the rule

after rupture which is not operated on, the patient is usually lost.

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APPENDICITIS.

Etiology.—Appendicitis is more common in the male than in the female sex; the majority of cases occur between the ages of 10 and 30. It is apparently always due to bacterial infection, except a few cases of amœbic infection, and many different bacterial forms have been described in association with it. Adhesions between the appendix and surrounding structures, and consequent kinking, predispose to the affection. An attack of appendicitis is sometimes preceded by acute tonsillitis, or inflammatory affections of the female sexual organs, or chronic suppurative cholecystitis, in such a way as to point to an etiological relationship between the conditions. The formation of fæcal concretions in the appendix seems often to be a determining cause of inflammatory attacks; foreign bodies only rarely have a like effect.

Pathological Anatomy.—In the mildest cases there is a catarrhal inflammation, with excessive secretion, and retention of the latter by narrowing of the lumen. Such a process may subside entirely by escape of the secretion, and the appendix may then return to the normal; often, however, some thickening of the wall remains, and a greater or less degree of inflammatory stricture. If the retention of the secretion persists, a condition of hydrops may be produced, but much more commonly the retained secretion is purulent, and the condition is then one of empyema of the appendix.

This catarrhal type often passes into another by ulceration and perforation of the wall; in some cases the perforation may take place at several spots, in others the whole appendix becomes gangrenous.

The peritoneum is involved in almost all attacks of appendicitis; in the slighter forms there is only slight adhesive inflammation, with scanty exudation; in the severer the exudate is more abundant and often purulent, even when there is no perforation; in this way the appendix may lie in the centre of an abscess. Such an abscess may disappear by absorption after a more or less prolonged time, or rupture into a hollow organ (most frequently the bowel), or it may be the starting-point of a chronic spreading peritonitis, in the course of which numerous intraperitoneal abscesses of different sizes are formed. The process extends along certain defined routes. Large abscesses are often formed between the bladder and rectum, extending thence over to the left side; in other cases the process extends upwards, and subphrenic abscesses form which may make their way into the pleura or the lung, or may further extend as an intra- or retroperitoneal process. In such cases all the coils of bowel may be adherent to each other and the abdominal parietes. Rupture through the parietes is unusual.

In other cases of perforative appendicitis or peri-appendicular abscess there is an absence of localizing adhesions, and an acute diffuse and universal peritonitis results. In such cases absence of an inflammatory mass in the right iliac fossa is usual.

The well-known "lump," which is to be found in so many cases, consists usually of œdematous and infiltrated omentum attached to coils of bowel adherent to each other and to the parietal peritoneum; in the centre of such masses there is often a collection of pus.

In some cases venous thrombosis occurs early, and may extend widely. As the thrombosis is often infective, a severe type of pyæmia may result, with the formation of abscesses in distant organs, particularly the liver.

Clinical Course.—Following the clinical description of Nothnagel, one may say that appendicitis is an affection which presents itself under the form of attacks with intervals.

An attack is often preceded by definite prodromal signs, but the onset is also often sudden, with pain, nausea, and vomiting. Signs of peritoneal irritation soon supervene as a rule, and there is usually fever lasting from a few hours to several days. In the right iliac region a cylindrical-shaped body can as a rule be felt, tender to pressure, and corresponding to the thickened appendix adherent to its surroundings. After the inflammation subsides, the thickened appendix often remains palpable for weeks; in other cases there is only a tenderness to pressure in the right iliac fossa, without any other recognizable abnormality. After a time all the subjective and objective signs may entirely disappear, and complete permanent recovery may follow.

In many cases, however, indefinite symptoms persist, such as a sensation of fullness or pressure, and often some irregularity of the bowels, chiefly in the direction of constipation. After such symptoms have persisted for a time, or after an interval of apparent well-being, another attack comes on which may be of a similar character to the first, or run a much more serious course. Operations have shown that even after a first attack such as has been described, thickening, or adhesions, or kinking of the appendix, or adhesions between coils of bowel, may remain of such a character as to be a source of permanent trouble to the patient.

The following case is a typical example. A little girl aged 13, previously healthy, after a sore throat, developed an appendicitis, with vomiting, slight fever, and tenderness and swelling of the appendix. The symptoms subsided on the second day, except that the appendix remained palpable and tender. A second slight attack occurred a year and a half later. Two years later, after a slight injury, a third attack came on suddenly, with vomiting, fever, and intense pain on pressure over the appendix. Operation was done by Dr. Schnitzler eight hours after the appearance of the symptoms. The appendix was long, its wall thickened, and its tip adherent to the omentum; the apex was kinked and globular. Further examination showed a ring stricture 2 cms. from the tip, empyema in the terminal portion, and disappearance of the mucous membrane above and below the stricture. The appendix was removed and the child recovered.

Appendicitis with tumour and abscess formation may occur as a return attack following one of less severity, or may commence acutely without prodromal symptoms in a patient previously healthy. At the onset there are usually vomiting, intense abdominal pain, rigor, and fever, and even symptoms of collapse (small pulse, sweating, cyanosis) are frequent. After one or two days the general symptoms improve; the abdominal tenderness, which was at first diffuse, becomes localized in the right iliac fossa; the general muscular rigidity passes off and becomes confined to the region of the appendix. In this region there appears a firm, fixed, tender, and ill-defined swelling, over which the parietes may be slightly fixed and œdematous. For the next three or four days the swelling either remains about the same size or may become more extensive, in which case suppuration will have taken place. It is rarely possible to make out fluctuation. When abscess forms, the pulse rate as a rule remains high; the observation of the temperature is of special importance. If fever persists beyond the fifth day there is almost certainly suppuration; rises of temperature with apyrexic intervals also indicate abscess in the absence of some lesion in some other organ to account for it. It is true, however, that even in the presence of extensive suppuration the fever may gradually subside. The position of the swelling varies with the position of the appendix; sometimes it is lateral, sometimes near the middle line, and in atypical cases it may be in the lumbar region, or in the pouch of Douglas.

Appendicitis with diffuse peritonitis and no tumour is usually rapidly fatal, with symptoms of marked collapse, intense abdominal pain, cyanosis, frequent vomiting, a rapid pulse of low tension, and subnormal temperature. In such cases the lesion is usually a large acute perforation, or gangrene of the whole appendix, or rupture of an already existing septic peri-appendicular abscess into the general peritoneal cavity.

In some cases the peritonitis runs an irregularly progressive course, with fibrino-purulent exudation. The temperature may then show marked irregularities; the tenderness and resistance which were at first only present in the right iliac fossa extend gradually over the greater part of the abdomen.

Free fluid is not present in the peritoneal cavity, but collections of pus may be found on rectal or vaginal examination, or the diaphragm may be found pushed upwards by a subphrenic abscess.

Rupture of an abscess into a hollow organ is not uncommon, but is less so in these days of early operation than it used to be.

Repeated rigors, followed by profuse sweating, when no tumour is present but there is tenderness on pressure, point to the onset of pylephlebitis. There is often a kind of correlation between appendicitis and inflammatory processes of the female sexual organs, in the sense that the one leads to an attack or a relapse of the other, and vice versa.

Diagnosis.—The presence of pain in the right iliac region, associated with a palpable and tender appendix, is diagnostic of appendicitis. Diffuse resistance in this region, with or without signs of peritoneal irritation, also points to appendicitis. When a patient is taken ill with fever, initial vomiting, and signs of peritonitis or septicæmia, the discovery of tenderness over the appendix region often settles the diagnosis. According to Murphy the following category of symptoms is so typical that any departure from it must make the diagnosis uncertain: (1) An attack of abdominal pain; (2) Nausea or vomiting from three to four hours afterwards; (3) General abdominal tenderness, but particularly on the right side; (4) Rise of temperature from two to twenty hours after the onset, never before the commencement of the pain.

In many cases an exact diagnosis of the type of the disease present cannot be made even by the most experienced clinicians.

The following symptoms point to the occurrence of *suppuration*, a matter of great practical importance: sustained fever for at least five days, persistent rapidity of pulse rate or gradual increase of the same, persistence or development of a tender swelling during the first five days.

Much has been written on the subject of leucocytosis. It is generally agreed that if at a single observation a leucocytosis of 20,000 to 25,000 or over is found, an abscess is probably present, if no other cause for the leucocytosis can be found. Absence of leucocytosis on the other hand

is not to be looked upon as evidence against suppuration. A gradual increase in the number of leucocytes during the first few days of the disease, up to 20,000 or over, and a maintenance of this increase is strong evidence of abscess, but leucocytosis will never be relied upon alone for the diagnosis. Such observations have not hitherto proved of any value in differentiating between circumscribed abscess and diffuse spreading peritonitis.

The so-called iodine reaction of the blood, that is to say, the brown staining of certain granules in the leucocytes, supports the diagnosis of suppuration when it is present in a marked degree.

It has been recommended that exploratory puncture should be utilized to discover the presence of pus, but this is a dangerous proceeding, and is only mentioned to be condemned. A fluctuating swelling in the pelvis connected with a resistance in the right iliac fossa, or the presence of a subphrenic affection, is conclusive evidence of suppuration; when pus makes its way into the pelvis there is often pain on passing water or distinct bladder tenesmus, and the pains often radiate to the right thigh.

Thrombosis of the portal vein or its branches must be diagnosed when fever of a pyæmic type develops and signs of metastatic sepsis, in association with a tender swelling, or pain, or both, in the appendix region. Sometimes the pyæmic symptoms are present for a long time before it becomes clear that the appendix is the primary cause of the infection.

A boy, aged 12 years, whom I had the opportunity of examining frequently with a colleague, had an illness the symptoms of which were vomiting and fever of a wholly irregular type. Each day he had one or two marked rigors. In the first few days endocarditis was found present. From the beginning there was a strong suspicion that the appendix was the cause of the whole condition, but until the third week there was neither pain nor tenderness in the right iliac region. Operation was done the first day these signs made their appearance, and thrombosis of the portal vein was found, the thrombus being partly disorganized and broken down. The boy died.

Gangrene of the appendix is to be diagnosed when there are signs of severe peritoneal irritation, intense localized

pain, and high pulse frequency, associated with absence of an inflammatory tumour.

Acute perforative appendicitis will be recognized by the sudden onset of excessively acute pain, collapse, vomiting, intense abdominal rigidity, rapid increase of fluid in the peritoneum, and rapid increase in the pulse rate ; in some cases the condition is distinguished by the disappearance of an already formed swelling, along with the development of marked meteorism.

A patient, about 40 years old, had an attack of appendicitis, from which he appeared to have recovered. Some months later, when in apparent health, he was suddenly attacked in the train by vomiting, excessively acute abdominal pain, and collapse. Some hours later there was a subnormal temperature, cyanosis of the extremities, extreme tenderness and rigidity of the abdomen, and signs of fluid in the peritoneum. Operation was performed by Dr. Schnitzler five hours after the onset; a large perforation was found in a gangrenous appendix, and free pus in the peritoneal cavity. The appendix was removed, the peritoneum was cleansed, and the patient recovered.

Rupture of an infective focus into the general peritoneal cavity is to be diagnosed (Dieulafoy) when the pulse becomes suddenly more rapid and the meteorism and abdominal rigidity increase, while the other symptoms simultaneously become less marked.

The diagnosis of acute progressive purulent peritonitis will be made when the abdomen is diffusely tender and distended, when the pulse becomes rapid and cyanosis increases, when the patient has a dry tongue, passes neither flatus nor fæces, and the abdomen contains free fluid. In the later stage there is a toxic euphoria, coffee grounds vomiting, a rapid and low tension pulse, cyanosis of the fingers, and great distension of the abdomen.

The subject of subphrenic abscess complicating appendicitis is discussed in a later chapter. In the early stages, when the pus is travelling upwards, the thigh is usually flexed and there is tenderness in the lumbar region.

Chronic appendicitis, the "appendicitis larvata" of Ewald, is often mistaken for other affections : nervous dyspepsia, gall-stone, gastric ulcer, affections of the bladder, etc. Sometimes a thickened appendix can be made out

on palpation, or the only sign of the disease may be tenderness on pressure in the right iliac region.

A young woman, 23 years of age, had been under treatment by several physicians for ulcer of the stomach, without relief to her symptoms. She was much depressed, had no appetite, and complained of various nervous disorders. The appendix was thickened and tender to pressure, and operation showed a chronic inflammatory condition. After the removal of the appendix the patient lost all her gastric symptoms, and remains well two years after the operation.

An officer complained of attacks of violent abdominal pain, which had been variously interpreted, mostly as stone in the kidney, in consequence of slight vesical symptoms. He had had no fever. The appendix was very tender to pressure, and the pains evoked by pressure were of the same character as those which occurred spontaneously. At the operation the appendix was found doubled up and adherent; its removal was followed by complete disappearance of the marked neurasthenia which had developed.

Differential diagnosis.—Many different affections are liable to be mistaken for appendicitis; I shall refer only to the most important. The history must be relied upon to differentiate perforative appendicitis from other types of perforative peritonitis. Attacks due to gall-stone or renal stone may usually be distinguished by tenderness on pressure over the liver or the kidney, or the onset of jaundice or hæmaturia, and by attention to the history.

Examination of the hernial orifices will exclude incarcerated hernia. In colic, pressure usually relieves the pain, and there is local meteorism. Psoas abscess is less abrupt in its onset than appendicitis, and is associated with signs of vertebral disease; hip-joint disease is distinguished by signs referable to the joint itself and the absence of tenderness or dullness in the right iliac region. In favour of perinephritis, and against appendicitis, will be the presence of an affection of the urogenital apparatus. Palpation will distinguish torsion of a floating kidney.

The gradual development of a tumour in the ileocæcal region, associated with diarrhœa, signs of progressive stenosis, and of tuberculosis elsewhere, points to a tuberculosis of the bowel.

If a mass in the right iliac region is large, intensely hard, of long standing, and infiltrating towards the surface, actinomycosis will be suspected. In new growth there is cachexia, intestinal stenosis, and hard, painless, and enlarged lymphatic glands. The discovery of a tender palpable appendix will serve to exclude nervous dyspepsia, gastric ulcer, chronic cholelithiasis, and renal stone. If, however, tenderness in the right iliac region is inconstant and varies much at short intervals in a neurotic patient, the condition is probably a neurosis and not chronic appendicitis.

In enteric fever the history of the disease, the enlargement of the spleen, and the rash, will usually serve for a diagnosis, but confusion between this disease and appendicitis often arises, and I have seen a patient with enteric fever operated on for supposed appendicitis.

INDICATIONS FOR OPERATION.

There is much difference among authors as to the indications for operation in appendicitis. I shall give some representative opinions, and also my own views founded on an extensive experience.

The indications as given by Nothnagel are, in outline, as follows :—

1. Operation is absolutely indicated for appendicular abscess, wherever situated, and as soon as possible.

2. In diffuse peritonitis, operation gives the sole chance of recovery, and should always be done unless the patient's general condition is so bad as to contra-indicate intervention of any kind. It is especially urgent in acute perforative peritonitis.

3. If symptoms of obstruction arise in the early or later stages of appendicitis, and it is not certain that the condition is due to peritonitis, laparotomy must be done for their relief.

4. In an attack of appendicitis *which has already lasted for* 12 *to* 36 *hours* without giving rise to signs of peritonitis, operation is absolutely necessary only if the process is suspected to be of a severe phlegmonous, diphtheritic, or gangrenous type. Such types are especially prone to occur in association with acute infective pharyngitis, and sometimes arise in epidemic form. In an acute appendicitis which does not appear to be of a malignant type, it is

legitimate to temporize, and if everything goes well it may be possible to avoid operation altogether.

5. When an inflammatory mass is present, the state of the pulse, the pain, and the progress of the inflammatory condition are the guides to operation. If there is a temperature of 39·5° or over on the fourth day, or if a temperature of 39° is sustained up to the sixth day, operation is necessary. It is also necessary if there is a recrudescence of fever lasting more than twenty-four hours. "In general a high temperature is an indication for operation, but absence of high fever is in no sense a contra-indication."

My own view is that if fever even of moderate degree persists beyond the fifth day it means suppuration, and operation is required.

A rapid pulse, and a low tension pulse also, generally indicate the necessity for operation, and the same is true of persistent acute pain or tenderness to pressure, and of increase in the size of the inflammatory mass beyond the first day or two.

6. In the apyrexic period, after the acute process has subsided, operation is called for (*a*) When certain troubles persist in a pronounced form, such as pain, sensations of fullness and weight, irregular defæcation, and menstrual disturbances; (*b*) On the onset of a relapse. A single attack of appendicitis which is followed by apparent complete recovery justifies operation for removal of the appendix, but it is not absolutely indicated, because three-quarters of the patients who have a single attack escape relapse.

Many surgeons recommend that operation should always be done after an attack, and at any rate after a severe attack. This recommendation may be accepted without hesitation if the patient lives in some place where surgical aid would not be available in case of a severe relapse.

Repeated relapses call for operation, particularly if they occur at short intervals, or if the patient is unable to regulate his diet.

Rotter distinguishes between acute circumscribed appendicitis and diffuse appendicitis, i e., appendicitis with diffuse peritoneal symptoms. In the former he recommends that operation should be done whenever possible in the interval after the attack. He considers

it necessary after a first attack in young patients (up to 35) who cannot be kept on a strict régime, and who are exposed to violent physical exertion. In the acute stage the circumscribed form requires operation when the symptoms are severe and in any way alarming. In the diffuse form it is necessary to operate when the vomiting and pain have not subsided on the third day.

Many writers uphold the view that all attacks of acute appendicitis call for immediate operation (Beck, MacBurney, Murphy, Dieulafoy, Tuffier, Kirmisson); others think it only necessary in the presence of disquieting symptoms (Lennander). The following reasons for early operation are given by Bohm: (1) The impossibility of recognizing the exact pathological type at the commencement of the attack; (2) The impossibility of giving a confident prognosis in the early stages of any attack; (3) The relatively small risk of early operation; (4) The relief of the patient from the risk of complications, particularly the post-operative complications, hernia, fistula, etc.; (5) The support of statistics.

After a study of the literature Bohm reports a general agreement in the following respects on the question of *operation in the acute stage of the disease:* (1) Operation should be undertaken when either at the commencement or in the course of an attack alarming symptoms and signs make their appearance, whether local or general; (2) When the symptoms of a typical acute attack do not show a definite tendency to improve during the first day or two in a uniform manner, in spite of careful expectant treatment; (3) When a sudden aggravation of symptoms occurs and does not rapidly subside in the course of an attack which previously had been of a benign type.

If appendicitis occurs during pregnancy many authors recommend early operation in view of the risk to mother and child if the infective focus persists.

Contra-indications.—Nothnagel and other writers advise against operation after a single attack, if the patient remains free from pain and other subjective symptoms and no abnormality can be discovered on abdominal examination. With this view I agree; for as has already been stated, in about three-quarters of all cases, recovery after a single attack is permanent.

Many authorities hold that a patient who is the subject of severe septicæmia and diffuse peritonitis is not a fit subject for operation ; it is particularly advisable to abstain from operation when a condition of shock of several days' duration co-exists with a state of comparative euphoria. Occasionally, though very rarely, spontaneous recovery occurs under such circumstances.

Such a result came under my observation some years ago in the case of a young man with perforative peritonitis following appendicitis. He had a dry tongue, blue extremities, a very small and rapid pulse, and subnormal temperature ; he was also vomiting constantly, and there was free fluid in the peritoneal cavity. The surgeon who saw the case considered it useless to operate. An exploratory puncture was made, and fœtid pus was withdrawn. For several days he remained in a condition of profound collapse, and then commenced to improve by slow degrees, and at the end of six weeks left the hospital in good condition.

Haenel expresses the view that in diffuse peritonitis no operation should be done when the intestine is completely paralyzed, when, that is to say, it is impossible to set up peristaltic movements by forcible percussion, and when none can be heard on auscultation.

Pyæmic symptoms with repeated rigors associated with only slight local signs, and signs which point to thrombophlebitis in the radicles of the portal vein, are looked upon by many surgeons as contra-indications to operation ; the only effect of operation would probably be to lessen the small chance which the patient has of spontaneous recovery.

Some surgeons place the boundaries of justifiable operation very far afield ; Rotter, for example, would only refuse to operate on moribund patients ; others, including Deaver, look upon the presence of constitutional disease, such as advanced phthisis, as a contra-indication. Fowler and others do not approve of early operation when a definite retrogression of all symptoms occurs within from 24 to 36 hours of the commencement.

The bursting of an abscess into the bowel, bladder, or other hollow organ, only contra-indicates surgical intervention (Sahli and Baumgartner) when the local and general symptoms are permanently improved thereby.

Prognosis.—*Results and risks of operation.*—Removal of

the appendix in the interval after an attack is a relatively slight operation. In 150 such cases Rotter lost one patient only. The risks are considerably higher in operation during the acute stage. In Rotter's cases the mortality between the years 1893–1895 was 7 per cent, between 1896 and 1900 5 per cent. These figures are for the circumscribed disease; among the cases of diffuse peritonitis due to appendix disease the mortality in the first period was 60 per cent, in the second period 34 per cent.

Sprengel has published figures drawn from the experience of several surgeons. Of 232 "interval" operations 2 died; among 284 operations during the attack, death occurred in 57. Of the latter cases 47 were operated on within the first forty-eight hours, with 8 fatalities; 237 later than this, with 49 fatalities.

Temoin records 179 operations during attack, with 19 deaths; 17 of these were operated on after the fifth day of the attack.

Mayo records 160 interval operations, without a death, 115 operations during attack, with 6 deaths. Lucas-Champonnière lost 12 cases out of 44, with more or less diffuse suppuration in the abdomen; out of 85 other cases he lost none.

Early radical operation is specially easy and free from risk only if done within the first twenty-four to thirty-six hours from the onset of the attack. By this early intervention, complications, such as hernia, fistula, etc., can in the great majority of instances be avoided.

According to Sonnenberg, embolus and other pulmonary affections occur relatively frequently after appendix operations.

The results of operation in chronic appendicitis are often extremely gratifying. The pain and other symptoms disappear, and I have often observed spontaneous regulation of the bowels in patients who had previously been much troubled by constipation. The patients usually also put on weight and improve greatly in appearance.

Operation during an attack often directly saves life. "Every patient with diffuse septic peritonitis who recovers after operation owes his life to the operation." In 35 cases of this kind Rehn reports recovery in 8.

Without operation.—It is stated that from two-thirds

to three-quarters of all cases of appendicitis recover permanently without operation. Nevertheless, the disease is full of surprises, and an apparently slight case must always be watched most carefully. It is an established fact that the prognosis of the course of an attack cannot be definitely stated, especially in the early stages. In a considerable percentage of cases troubles of various kinds persist after the attack; these have already been described under the term "chronic appendicitis." In many cases there are return attacks of varying degrees of severity, from the slightest to the most dangerous.

In perforative appendicitis with peri-appendicular abscess, the abscess may subside to a certain extent but never completely, and is a persistent menace to the patient. I have often seen autopsies on patients dead from septicæmia, in which such small abscesses were the cause of death. Abscesses often, however, run a progressive course, with the formation of fresh collections throughout the peritoneum. The rarity of subphrenic abscess now as compared with some years ago is due to the practice of early operation in appendicitis.

In other cases perforation leads to death in a few hours to a few days from septic peritonitis or pylephlebitis.

The percentage of deaths among cases of appendicitis not operated on has been given somewhat variously by various authors according to the manner in which the cases have been grouped. The figures vary between 6–10 per cent (Renvers) and 30 per cent (Beck). By different arrangement of the figures the surgeons seem to arrive at the high percentages, the physicians at the low percentages! Certainly, the proportion is at least 10 per cent.

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CHAPTER XVI.

Diseases of the Peritoneum.

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DISEASES OF THE PERITONEUM.

ACUTE CIRCUMSCRIBED PERITONITIS.

Etiology.—Inflammatory processes of any organ which has a peritoneal covering may lead to a circumscribed peritonitis. Excluding appendicitis, which has been considered in the last chapter, the commonest causes are affections of the female generative organs (puerperal processes, abortion, gonorrhœa), and of the gall-bladder; and, less frequently, ulcerative processes of the stomach and intestine and inflammatory affections of the parenchymatous organs.

Pathological Anatomy.—The peritoneal inflammation may be fibrinous, serous, purulent, or septic; in this circumscribed type it remains limited by adhesions to the neighbourhood of the primarily affected organ, and becomes encapsuled. Under a continuance of the irritation the amount of exudate increases; if the latter is purulent or septic there is a great tendency for it to make its way from the primary seat to other parts. Rupture of the exudation may occur into the general peritoneal cavity, the vagina, the bowel, or the bladder; often it is completely absorbed. Sometimes, but rarely, this circumscribed peritonitis is complicated by thrombosis of mesenteric veins and pylephlebitis.

Clinical Course.—At the commencement of an attack of peritonitis of this type there is usually slight distension of the whole abdomen, diffuse pain, vomiting, and constipation. In the course of from one to two days the general signs recede and the local signs become more prominent. The patient complains of pain in the region of the primary focus, and is tender to pressure here; about the same day a resistance is felt, which in the course of twenty-four hours becomes sharply defined, and is due to the exudate and to

adhesions between coils of bowel and thickened omentum. With the aid of an enema the bowels can usually be got to act about this time, the meteorism subsides, and rigidity of the abdominal wall is confined to the region of the "lump." In addition to the local exudate some free fluid may be found in the peritoneal cavity, but usually only after the peritonitis has been present several days. After the first few days the general condition is relatively good; fever is often absent. If fever persists the exudate is probably purulent. The pulse is of good tension and the rate either normal or only slightly increased. If the pulse becomes steadily more rapid the disease is probably extending.

Diagnosis.—The symptoms just described will establish the diagnosis of circumscribed peritonitis. If the history is indefinite, either the appendix, the female sexual organs, or the gall-bladder will be first suspected as the point of origin of the infection. The diagnosis of acute appendicitis has been discussed in the previous chapter. Pelvic peritonitis is associated often with functional disturbance of the female sexual organs (sudden pronounced hæmorrhage or onset after hæmorrhage); pain is also most marked deep in the pelvis and in the neighbourhood of the hip, and there is frequently pain in micturition and defæcation. On vaginal palpation a parametral swelling is found, which may encroach on the rectum behind to a marked extent. Abscesses which result from pelvic peritonitis are usually situated towards the bottom of the pelvis, and are bounded by rectum behind and bowel above; sometimes they are more in front of the uterus, and may then be palpable above the pubis. The history of the case must be relied upon to differentiate an extra-uterine gestation, which is associated with signs of internal hæmorrhage.

Marked inflammatory effusion around the gall-bladder, particularly in cholelithiasis, may be recognized by the development of a tender swelling below the edge of the liver, usually not moving with respiration, and associated with signs of severe peritoneal irritation, which gradually become limited to the region of the swelling; it may be possible to make out that the latter is of a definitely doughy consistency, or even fluctuating. Differential diagnosis from cholecystitis is not easy and sometimes impossible, but the tumour of cholecystitis is pear-shaped and moves

with respiration, and the signs of peritoneal irritation are not so pronounced.

INDICATIONS FOR OPERATION.

Acute circumscribed peritonitis requires operation whenever a collection of pus forms. As a rule, such a collection is treated by simple incision, and no attempt is made to deal with the affected organ directly until the acute inflammatory condition has subsided ; precautions are also taken against the infection of the general peritoneal cavity.

When can suppuration be diagnosed with certainty ? " Gradual, sometimes comparatively rapid, increase in size of the inflammatory swelling, increase in the local tenderness, alteration in the consistence of the swelling from hard to doughy : these signs, along with alterations in the pulse and temperature, will lead to the diagnosis. Sustained or oscillating fever is an important indication of abscess " (Körte). When an intraperitoneal abscess makes its way into the deeper parts of the abdomen, bimanual examination often gives valuable information. A dull percussion note over the resistance is in favour of abscess, but a tympanitic note does not negative it, because an intestinal coil may lie in front, or the abscess may contain gas.

Exploratory puncture has often been employed to decide the presence of pus, but to pass a needle into an intraperitoneal abscess is a risky proceeding, and should at any rate never be done unless preparations are made to open the abscess immediately after.

Blood examination is often valuable. A steadily-increasing leucocytosis, up to twice or three times the normal, points to suppuration. A single observation also, if it reveals a leucocytosis of 18,000 or over, points to the same. Of less value are observations on the presence of glycogen in the white corpuscles, shown by the yellow or brown staining of granules ; little reliance will also be placed on the development of peptonuria.

Even when an increase in size of the inflammatory swelling cannot be definitely determined, and there are no signs of fluctuation, if the temperature remains up or continues to rise, and if the pulse rate gradually mounts, an abscess is almost certainly present, and operation should be recommended.

Contra-indications.—Operation is not necessary when there are no signs of suppuration; a serous inflammation tends to recede spontaneously. Generally speaking, early operation is contra-indicated. In peritonitis of this type, adhesions limit the focus, and the later the operation the more securely is the infective process shut off, but operation should never be delayed once pus is diagnosed. Exploratory puncture is specially contra-indicated if there is a tympanitic note over the swelling.

If thrombophlebitis complicates the peritonitis, operation is usually inadvisable if there is no definite local inflammatory swelling; the general symptoms of thrombophlebitis are marked peritoneal irritation, high fever, repeated rigors, and profuse sweating.

Prognosis.—*Results of operation.*—In most cases the opening of the abscess is followed by gradual complete recovery. In some instances, however, the inflammatory condition is recrudescent, and secondary abscesses form in the neighbourhood of the first after the latter has been opened, necessitating repetition of the operative interference.

Sometimes it is necessary to operate afresh later, and remove the primary source of the infection.

Without operation.—In a not inconsiderable number of cases, particularly in those which have their origin in the female genital organs, a kind of natural healing takes place by encapsulation and gradual absorption of the exudate. This eventuality may be expected when the general inflammatory signs subside, the fever lessens, the pulse becomes normal, the local tenderness and resistance disappear, and no fluctuation is to be found.

In many other cases the inflammatory condition tends to spread; with the development of abscess comes the risk of septic absorption and septicæmia. Pylephlebitis is another danger; and lastly there is the risk of rupture of the abscess into the general peritoneal cavity, setting up a diffuse peritonitis.

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DIFFUSE PERITONITIS.

ETIOLOGY.—In the great majority of cases diffuse peritonitis results from the entry of pyogenic bacteria into the peritoneal cavity. The most common source of the infection is the appendix, and then follow certain other abdominal organs—the female genital organs, the stomach, the intestinal tract, the gall-bladder, the pancreas, etc. The peritoneum may be suddenly flooded with more or less infective material by rupture of a hollow organ. In some cases peritonitis occurs as a metastatic condition, and it may also develop after operation.

Aseptic peritonitis results from chemical or mechanical irritants; thus it may follow rupture of a hydatid cyst, or effusion of blood, or injury to the serosa.

PATHOLOGICAL ANATOMY.—Mikulicz distinguishes the following forms of peritonitis; the diffuse septic, the progressive fibrino-purulent, and the circumscribed purulent. A fourth type is often described under the term septicæmic peritonitis.

The *diffuse septic* form occurs from sudden general infection of the peritoneum by, for example, perforation of one of the hollow organs. Adhesions between intestinal coils are absent; the exudate is thin and either purulent or serous.

The *progressive fibrino-purulent* type occurs when the inflammatory condition progresses by stages, so that in the course of several days the greater part of the peritoneum becomes infected from a small original focus—the appendix, for example. Such a mode of progression is associated with the formation of various adhesions between the intestinal coils and other abdominal organs.

The third type, circumscribed peritonitis, has been described in the previous pages.

Septicæmic peritonitis occurs from the introduction of bacteria of very high virulence into the peritoneum, and is most common as a post-operative condition; pathologically, no changes are found particularly characteristic of this excessively rapid form.

Rauenbusch distinguishes the different forms topographically, according as they are supra-omental or infra-omental, descending from above downwards, or ascending from below upwards.

The digestive tract is the point of origin of the disease in the majority of cases, and most frequently through the medium of perforating ulceration, or direct wounds. Neoplasms and phlegmonous and ulcerative processes may cause peritonitis without actual perforation.

Other sources of infection are the puerperal and gonorrheal infections of the genital organs, cholelithiasis and its sequelæ, abscesses of the liver, and hydatid cysts; in rare cases the point of origin has been a pancreatitis or a splenic abscess.

Clinical Course.—This type of peritonitis usually begins acutely, often with a rigor, and as a rule the patient feels extremely ill. The respiration is shallow and rapid. The pulse rate is increased, and becomes continuously and markedly accelerated with the progress of the disease. The temperature is often much elevated, particularly in cases where the peritonitis is only part of a general septic infection, as for example in puerperal peritonitis. Absence of fever is not, however, evidence against peritonitis; even the purulent types may run an entirely apyrexic course. In these cases, it is true, the rectal temperature is often considerably higher than the axillary. The patient is restless and distressed, the expression anxious, the nose pinched, and the extremities cyanosed; he is fully conscious, but may fall into a stupid state later; not uncommonly there is a sense of well-being before death. The voice is small and without resonance, the tongue dry and coated; the urine is scanty and concentrated.

Abdominal pain is often localized at first to the region whence the disease starts, but in other cases the patient complains of general pain, or refers it to the neighbourhood of the umbilicus. As the disease progresses, the pain becomes diffuse, but it may still be greatest at the seat of origin. At the first onset it is very acute; later, when exudate

forms and septic phenomena develop, it often becomes less violent. The amount and the nature of the exudate vary greatly in the different types of the disease. Sometimes the amount is so small as to be hardly demonstrable by percussion; in other cases fluid distends all the dependent parts of the abdominal cavity. In some of the gravest forms, the amount of the exudate and other peritoneal symptoms are insignificant compared with the general phenomena. Fluctuation, particularly in the early stages, is often extremely difficult to make out; its demonstration is best attempted by spreading one hand on the abdomen and imparting movements to the fluid by tapping on the middle finger with the bent thumb of the other hand; these movements should then be appreciated by the thumb which lies on the abdomen. If the exudate is rich in fibrin, friction is sometimes heard over the liver or spleen. When there is free gas in the peritoneum the liver dullness diminishes with the patient in the dorsal position.

Vomiting is rarely absent, and is often the most distressing of all the symptoms. It soon becomes bilious; in septic peritonitis it may be of coffee-ground character, and if the bowel becomes paralyzed it is, as a rule, fæculent. The abdomen is usually distended; neither flatus nor fæces are passed, and purgatives are ineffectual; the septic types alone are relatively often associated with diarrhœa.

Perforative peritonitis often sets in without warning, but in many cases there is a history of previous symptoms referable to one or other of the abdominal organs. The onset is sudden, and the pain agonizing; in the first few hours the patient is collapsed, the pulse small and rapid, the abdomen retracted, and the muscles board-like, the temperature often somewhat subnormal. After several hours the signs of peritonitis appear—fever, meteorism, vomiting, and general tenderness.

In perforation of a typhoid ulcer the first symptoms are usually violent pain and shock; sometimes the patient is very restless some hours before the perforation; in other cases the early symptoms are not acute and there is no abrupt onset; this was the case in two instances which I have recently seen. The temperature may fall rapidly or rise abruptly with rigors. The other symptoms are those common to perforative peritonitis generally.

Circumscribed purulent peritonitis often begins with general peritoneal symptoms, meteorism, diffuse tenderness, vomiting, constipation, rapid pulse, and peritoneal effusion. After some days the inflammation becomes definitely localized and the generalized symptoms subside (see last Section, p. 271).

In progressive fibrino-purulent peritonitis (Mikulicz) the phenomena are at first fairly localized, and gradually the tenderness to pressure and the distension extend more or less throughout the abdomen. When well established, the phenomena are those of a general peritonitis. The condition may assume a chronic character, and in this case the pain and vomiting subside, the general symptoms improve, the collections of pus increase and may penetrate into some hollow organ, and the disease generally tends to run a latent course for a long period.

Diagnosis.—Peritonitis is not difficult of recognition if the characteristic symptoms are borne in mind—the pain, vomiting, meteorism, intestinal paralysis, and exudation. *Often in the early stages it is not possible to decide whether an attack will result in a localized or a diffuse condition.*

Differential diagnosis.—Cases occur in which it is very difficult to exclude gall-stone or renal colic, and both these forms of colic may be associated with marked signs of peritoneal irritation. The tenderness and pain are, however, more or less localized to the neighbourhood of the affected organ, and the parietes are here more rigidly contracted than elsewhere. A certain degree of meteorism may accompany these forms of colic. Frequent desire to micturate, rectal tenesmus, blood in the urine, or complete anuria, are in favour of renal stone; bile pigment in the urine, jaundice, and the presence of a gall-bladder swelling, point to gall-stone.

Uræmia is to be distinguished from peritonitis by the results of the urine examination, by the onset of loss of consciousness and convulsions, and by the physical examination of the abdomen.

It is sometimes very difficult to make a diagnosis between intestinal obstruction and peritonitis. The presence of well-marked peristaltic movements, particularly if definite local contracture of the bowel can be made out, local and not diffuse tenderness, and the absence of muscular rigidity

of the abdominal walls, point to obstruction rather than peritonitis. Fever, free fluid in the peritoneum, diffuse tenderness, leucocytosis, and very severe general symptoms from the beginning, are in favour of peritonitis. In peritonitis the pain is continuous, in obstruction it tends to come on in attacks. Meteorism, paralysis of the gut, frequent and fæculent vomiting, are symptoms common to both affections. The absence of fever is not a reliable guide alone; peritonitis may run an apyrexic course.

INDICATIONS FOR OPERATION.

In all forms of perforative peritonitis operation is urgently called for. The initial shock which occurs must be treated, and not allowed to delay operation to any considerable extent.

The abdomen should be opened whenever possible within the first few hours, whether the diagnosis is quite clear or only suspected, whether the symptoms point to perforation of the stomach, duodenum, gall-bladder, or appendix, or can be traced to the female generative organs or to a typhoid ulcer; or when, the cause of the condition being obscure, a patient previously in health is suddenly attacked with pain in the abdomen, and collapse, and the abdominal parietes are found rigid, and free fluid and gas are shortly afterward found present in the peritoneum.

In cases of diffuse inflammation which begin without the symptoms of perforation, the rule should be followed to operate as soon as the symptoms point to an extending peritonitis.

In the progressive fibrino-purulent type of the disease the abdomen should also be opened at as early a stage as possible, and the purulent collections evacuated.

The operative procedure in these conditions consists of opening the abdomen under general anæsthesia (exceptionally under local infiltration anæsthesia) and mechanically cleansing the affected peritoneum. Many surgeons irrigate with normal saline solution. A perforation must be closed by suture; it is often necessary to puncture or incise distended bowel. When paralytic-ileus develops in the course of typhoid fever, recognized by a rapidly-progressive meteorism, it is necessary to establish an artificial anus (Escher).

Contra-indications.—If from the commencement of the illness the signs of general intoxication overshadow the local signs, if, that is to say, there is an early onset of tachycardia and cardiac failure, cyanosis, shallow respiration, and shock, whilst the amount of exudate is small, operation will be useless, and is therefore contra-indicated.

When the signs of what seemed at first a diffuse peritonitis have become localized and restricted, operation should, as a rule, be delayed until the resulting abscess can be opened without risk of contaminating the general peritoneal cavity.

When peritonitis occurs as a single phenomenon in the course of general puerperal septicæmia its surgical treatment is inadvisable.

A gonorrhœal peritonitis secondary to disease of the female genital organs does not call for early operation; it should be watched and treated on expectant principles; many cases recover spontaneously.

Prognosis.—*Results and risks of operation.*—In perforative peritonitis laparotomy often saves life; the perforation is closed and further escape of infective material thus prevented, or the perforated structure (appendix) is removed entirely; much toxic exudate is also removed from the peritoneal cavity, and the intraperitoneal pressure is relieved.

When operation for perforation is done within 12 hours, two-thirds of the cases are saved, but only one-third of those operated on during the second 12 hours. When there is a delay of 24 hours over 80 per cent die.

In typhoid perforation from 20–25 per cent are saved by operation; of 87 cases collected by Loison, 16 recovered. Of these 16 cases six were operated on from six to twelve hours after perforation, four between the twelfth and the twenty-fourth hour. The latest statistics are those of Zesas—95 recoveries in 255 cases. Of Hartmann's cases 75 were operated on within the first 24 hours with 19 recoveries, 38 later than this with 6 recoveries. The later in the attack the perforation occurs the more favourable is the operative prognosis; in the second and third week only 14 per cent recover, in the fourth week 37 per cent, and later than this about half the cases are saved.

In cases of perforation of gastric ulcer the results of

operation are relatively good: about 50 per cent recover, probably owing to the fact that operation is in most cases resorted to early.

In diffuse peritonitis originating from the appendix, from 28 to 36 per cent are rescued by operation.

The risk from operative shock is apparently great; vomiting may persist in spite of operation. Secondary collections of pus may form throughout the abdominal cavity and require opening. Pleurisy and pericarditis may supervene; in one of my cases bilateral perforation of the diaphragm occurred eight days after operation with a fatal result. Ventral herniæ often occur when the abdominal wounds are tamponed.

Without operation.—When the phenomena of general intoxication predominate the prognosis is excessively grave. Cases of septicæmic peritonitis of this type die as a rule after a period varying from a few hours to a few days. Diffuse purulent spreading peritonitis nearly always ends in death; occasionally a case becomes chronic and eventually recovers; the length of time a patient lasts varies very much; some die in the course of a few days, some survive for several months.

Acute perforative peritonitis is also usually fatal; in rare cases the condition localizes itself by adhesions, and the patient recovers.

Aseptic peritonitis, caused by mechanical or chemical irritation, often ends in recovery, sometimes after very alarming early symptoms.

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CHRONIC EXUDATIVE PERITONITIS.

Etiology.—Trauma is undoubtedly one of the causative factors of this condition. Nephritis and obstruction of the portal circulation (hepatic cirrhosis) appear also to give rise to it.

Pathological Anatomy.—The exudate is sometimes free, sometimes encapsuled. After the disease has been present for some time the peritoneum is thickened, and has a pearly-white appearance; sometimes it is studded with small fibrous nodules, not tuberculous (peritonitis fibrosa).

Clinical Course.—The disease usually begins insidiously with abdominal pain and distension. There is often a complete absence of fever. The exudate has the general characters of inflammatory effusion; sometimes there is œdema of the lower extremities and of the abdominal wall. Vomiting, circulatory disturbances, and other symptoms of a general character are usually absent, nor are there recognizable changes in the abdominal organs.

Diagnosis.—The diagnosis of this condition can only be provisional, as it is impossible before operation to exclude tubercular peritonitis. The fluid gives a negative result on inoculation, and there is no reaction to tuberculin, but these negative results are not sufficient to enable one to be certain on the matter. For the differential diagnosis

from other conditions the section on tubercular peritonitis should be consulted (p. 288).

INDICATIONS FOR OPERATION.

If this form of peritonitis is suspected, the abdomen should be punctured if the ascites is marked and troublesome, or dangerous symptoms have arisen; such symptoms are dyspnœa, tachycardia, arythmia, œdema of the legs, etc. The opening of the abdomen and irrigation, which has been recommended by several writers, is not a proceeding which I approve in the ordinary case, as the prognosis is in general good and the disease usually subsides spontaneously. Laparotomy is at any rate contra-indicated when the exudate has commenced to diminish.

PROGNOSIS.—*Results of operation.*—By means of puncture the patient can be tided over the worst period of his disease while the fluid is accumulating, and in this way the operation may be directly life saving. Once the inflammatory process has passed its height the patient is out of danger. Laparotomy, with lavage of the abdominal cavity, shortens the period of inflammation and produces a more rapid healing.

Without operation.—If an expectant tonic treatment is persevered with, the exudate as a rule commences to disappear and the pains to diminish in the course of some weeks or months, seldom sooner. There may be remissions and exacerbations. After the disease has subsided there often remain adhesions and thickenings of the peritoneal covering of the abdominal organs.

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CHRONIC INDURATIVE AND ADHESIVE PERITONITIS.

ETIOLOGY.—This form of peritonitis may be caused by bacterial, chemical, or mechanical irritation. It occurs with especial frequency as a residuum of acute and subacute

peritonitis, also in association with chronic inflammatory processes following affections of the female genital organs, the liver and gall-bladder, and with ulcerative processes and stenoses of the stomach and intestine.

Constipation, hernia, abdominal wounds, operations, intra-abdominal menstrual hæmorrhages, are also factors of etiological importance.

Syphilitic processes in the liver and spleen may give rise to dense peritoneal adhesions.

Pathological Anatomy.—The process may lead to adhesions between the surfaces of organs or to the formation of bands. As a result there may be kinking of the hollow organs and displacements or fixation of others. Sometimes the mesenteric structures become shrunken, particularly the mesentery of the sigmoid flexure (an important cause of volvulus), the cæcum, and the lower part of the ileum. Typical situations for the development of adhesions are at the point where the descending colon passes into the sigmoid colon, and at the hepatic and splenic flexures.

A special form of the disease is the chronic hyperplastic perihepatitis (Zuckergussleber), which results in the enveloping of the whole liver in a whitish membranous exudate; it is almost always associated with chronic pleurisy and pericarditis.

The diffuse form of chronic peritonitis with general adhesions between all the abdominal organs is very rare.

Clinical Course.—Extensive adhesions often form without giving rise to any symptoms, but in other cases even slight adhesions cause serious lesions by narrowing or occluding bowel or by providing the mechanism of an internal strangulation, for example, by fixing the extremity of the appendix or of a Meckel's diverticulum. Adhesions at the flexures give rise to the following symptoms (Gersuny): persistent chronic constipation, pains on both sides of the lower part of the abdomen, increase of the pain, especially that on the left side, during defæcation and during exercise.

Adhesions in the neighbourhood of the gall-bladder often simulate chronic cholelithiasis. Two cases under my own care were operated on for supposed gall-stone, all that was found being adhesions around the gall-bladder fixing the neighbouring coils of bowel. Separation of the adhesions

cured the one, but in the other the symptoms returned again after a month's respite.

In other cases the symptoms resemble those of gastralgia, renal stone, or intestinal colic, and often the whole course of events is obscure. Among the symptoms, pain always predominates, and it may be aggravated by all the causes which stimulate the functions of the contractile organs and often by simple changes in the position of the body.

Diagnosis.—In many cases the symptoms are so capricious that some form of neurosis is suspected. Sometimes, however, diagnosis is possible, for example, when a band can be palpated, or when, after certain morbid affections, symptoms come on which are difficult to explain, except on the supposition of peritoneal adhesions.

After cholelithiasis, for example, if signs of pyloric stenosis appear they will be ascribed to adhesions, and diagnosis is also possible where symptoms of intestinal stenosis co-exist with hernia or follow penetrating wounds of the abdomen.

A patient under my care had an old scar in the ileocæcal region, probably due to an appendicular abscess. He was admitted to hospital on account of acute pains in the abdomen coming on in attacks. A coil of small bowel with thickened wall was found present constantly at the same spot. Diagnosis: Adhesion of the coil to the scar left by the abscess and kinking. No operation could be done. The autopsy revealed adhesion by a band between a coil of small bowel and the parietal peritoneum.

A workman, 35 years of age, had received a knife wound of the abdomen; this healed uneventfully. He had since complained of pain over the stomach, especially after a meal. Examination showed a small hernia of the scar in the linea alba. Operation revealed an adhesion here between the bowel and the abdominal wall, and the separation of this was followed by complete disappearance of his symptoms.

Adhesions will always be suspected when the patient has suffered from some disease likely to cause local peritonitis, and when he complains of persistent or intermittent pain, which the original lesion cannot explain, as, for example, when after an apparently healed gastric ulcer the patient complains of intense pain without tenderness to pressure

particularly after a meal, and when pains are present in the region of the gall-bladder in certain positions of the body subsequently to an attack of cholelithiasis.

Since the diagnosis is hardly possible before operation the differential diagnosis need not be discussed.

INDICATIONS FOR OPERATION.

If the clinical signs suggest peritoneal adhesions, and if there are persistent or intermittent pains, operation is indicated when the patient is depressed by his malady, when his general nutrition is suffering, or when marked neurasthenic or hysterical symptoms supervene. Operation is also called for when the condition interferes with the patient's working capacity, as, for example, when he cannot assume certain attitudes without pain.

The indication for operation becomes absolute when signs of gastric or intestinal stenosis suddenly or gradually supervene, or when there are signs of obstruction from volvulus, a condition which is liable to occur when the mesentery becomes shortened by cicatricial contraction.

Contra-indications.—If the symptoms are only slight and occasional, operation is rarely necessary. When there is reason to believe that the adhesions are very extensive, the result, for example, of a general peritonitis which has progressed slowly to recovery, the gravity of the necessary procedure will deter the surgeon; but even under these circumstances, if the indication is absolute and the sufferings are unbearable, operation must be undertaken.

Prognosis.—*Results and risks of operation.*—In many cases the results of operation are to the patient nothing less than miraculous. In some cases the operation proves a very simple matter, but in others it is extremely complicated. The separation of the adhesions may be very laborious and attended by much risk of damage to the bowel, sometimes requiring more or less extensive resection. The risk to the patient will of course vary greatly according to the gravity of the operation. It is usually impossible before operation to estimate the risk in any given case, and it is always wise to give the patient and his friends to understand that the operation is a serious one, and to allow them to share in the decision, and gauge the necessity in comparison with the severity of the symptoms. In every case there

is the chance that the adhesions may re-form, and means must be taken by the surgeon to prevent this as far as possible.

Without operation.—Many patients with peritoneal adhesions suffer greatly for many years. When the adhesions obstruct the lumen of the bowel the whole train of symptoms characteristic of stenosis supervene, and may terminate fatally.

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TUBERCULAR PERITONITIS.

Etiology.—Tubercular disease of the peritoneum is rare as a primary condition; it is usually secondary to tubercular affections of the lungs, genital organs, intestine, bones, joints, or lymphatic glands; it is especially common in children.

Pathological Anatomy.—Three types of the disease are distinguished (1) That with abundant free serous exudate; (2) That associated with the formation of adhesions between the coils of intestine and between these and the abdominal parietes, and the development of large masses in the omentum and the peritoneum, and shrinking

of the mesentery; (3) The purulent ulcerative form with adhesions between the different foci.

Clinical Course.—The disease often begins insidiously. The first symptom is usually pain in the abdomen of a moderate degree of severity. Exudation then usually collects rapidly. Fever may be entirely absent, but in most cases there is at any rate an evening rise. Meteorism, difficulties in micturition constipation, and vomiting, are symptoms which usually then supervene. The exudate is at first free in the peritoneum, and tends later to become limited by adhesions. At this stage, nodules are often palpable, partly due to thickened omentum, partly to infected lymphatic glands, and partly to adhesions between the coils. Such swellings are specially common in the hypogastrium and the right iliac region

The general condition usually suffers markedly, the appetite fails, and diarrhœa is not uncommon. Symptoms referable to stenosis or kinking of the bowel are rare.

Diagnosis.—When an intraperitoneal effusion is discovered in a patient with tubercular disease elsewhere, without the co-existence of any acute abdominal symptoms, the condition is probably tubercular peritonitis. A characteristic livid appearance of the parietes in the neighbourhood of the prominent umbilicus, supports the diagnosis If there is no tuberculous disease elsewhere, an inoculation experiment with the fluid withdrawn by puncture will be of assistance. The reaction to tuberculin may also be tested, but the method must be cautiously employed. The formation of tumour-like masses or bands, particularly in the hypogastrium, associated with some disappearance of or encysting of the fluid, will add confirmation. The presence of peritoneal friction points only to the peritoneal nature of the effusion. The passage of acholic fatty stools is somewhat in favour of the tubercular nature of a peritonitis.

In carcinomatous peritonitis there is no encysting of the exudate, and the presence of new growth in other organs can be demonstrated.

Hepatic cirrhosis is associated with enlargement of the spleen, and is characterized by hæmatemesis and free diarrhœa, and the pain, fever, and other symptoms of peritonitis are absent.

The "ascites of young girls" disappears after the first menstruation, and leaves no tumour-masses behind.

INDICATIONS FOR OPERATION.

There is a great divergence of opinion as to the indications for operation in tubercular peritonitis. There is no doubt that laparotomy has been immediately followed by clinical and anatomical recovery in many cases, and on this ground it has been claimed by many writers that the proper treatment of the disease is by operation. Some surgeons have advised operation only in the cases with free or encysted exudate; others have operated on all types, even when tumour-like masses were present.

Physicians have of late years become more and more inclined to the conservative treatment of the disease in all its forms.

I consider operation called for under the following circumstances: (1) When the exudate is free, and is present in such amount as to cause serious symptoms and endanger life; (2) When perforation-peritonitis supervenes, provided that there are no serious tuberculous lesions in other organs; in all my cases there has been advanced disease in other organs, and I have, therefore, never advised operation. (3) When, in the serous or the adhesive forms of the disease, internal and external treatment has proved unavailable after several months' trial, and when the other organs are either free from disease or only slightly affected.

The indications under the two last headings are not absolute. Practitioners will do well to follow as a general rule the present trend of opinion, and incline towards conservative rather than operative treatment.

The operative procedure adopted in most cases has been the opening of the abdomen, with or without wiping over or washing out the cavity. Other surgeons have injected sterilized air or irritating substances—iodoform, naphthol-camphor, etc. The separation of adhesions has rarely been undertaken. Relatively often the abdomen has been punctured to relieve dangerous symptoms caused by the accumulated fluid.

Contra-indications.—The advocates of operation look upon advanced tuberculosis of other organs as the only contra-indication to operation, and do not consider as such

the presence of fever or tuberculosis of other serous membranes. Others, however, consider that the form of the disease which is associated with sustained fever, particularly when there are also masses formed in the abdomen, is unsuitable for operation, and is unfavourably influenced thereby. According to Borchgrevink, when there is no fever the disease usually runs a favourable course, and operation is not required.

Prognosis.—*Results of operation.*—It is difficult to gauge the value of operation from the quoted statistics, as they have been compiled from such opposite points of view. It is true that many cases recover after laparotomy, but it has been objected by those who are against operation that the same result might have been obtained without opening the abdomen. All, however, who have watched the course of such cases must admit that clinical and anatomical recovery often results and is permanent. The percentage of recoveries given by different writers varies between the 33 per cent of Frees and the 94 per cent of Mazzoni; but the figures for the most part do not deal with the question of permanent recovery. Those given by König are important in this respect: in 161 operations there were 65 per cent of recoveries, but permanent cure after 2 years in 24 per cent only. Margarucci also gives somewhat similar figures, 253 operations, 75 per cent recoveries, 26 per cent permanent cures.

Risks of operation.—Simple abdominal section for tubercular peritonitis is relatively free from risk; in very few cases has death occurred ascribable to the operation. Insufflation is also a harmless procedure. The presence of complications makes the prognosis graver; within one year I lost three cases on this account; in one there was an intestinal tuberculosis, and in the other two there was a complicating liver affection. Puncture when the fluid is free is not dangerous, but accidents may happen when it is encysted; two cases of my own succumbed to a wound of the bowel, although in each case the surgeon was experienced; the punctured bowel was adherent, empty, and dull to percussion.

Fæcal fistula has developed relatively often after operation; according to Friedlander this complication occurs in about 4 per cent of fatal cases which are not operated on, while among the cases fatal after operation it is present about a

quarter (Borchgrevink) or even a half (Körte). It must be noted that these figures refer to fatal cases, not to all cases

Without operation.—Spontaneous recovery often occurs after a varying duration of time, even when at one stage or another the symptoms are marked and alarming, and I have seen many cases in which this recovery was permanent. The figures of A. Frank and Borchgrevink appear to show that spontaneous cure is more common among the non-operated than among the operated cases. Frank records cure in a half, Borchgrevink in 81 per cent, of the first, while among the operated cases the recoveries are given by these writers respectively as 38 per cent and 63 per cent. In regard to the late history of the unoperated cases, the figures given by Rose from Naunyn's clinic are interesting; of 56, two-thirds died, one-third, including some severe cases, recovered.

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CHAPTER XVII.

Diseases of the Peritoneum

(*continued*).

Chapter XVII.

DISEASES OF THE PERITONEUM (contd.).

TUMOURS OF THE PERITONEUM, OMENTUM, AND MESENTERY.

Etiology.—Cystic tumours may make their appearance at any age; diffuse new growths of the peritoneum are most common in advanced age.

Pathological Anatomy.—The malignant growths are usually metastatic, secondary in particular to cancer of the uterus, stomach, bowel, pancreas, or gall-bladder. Diffuse sarcomatous growths (sarcomatosis peritonei) are comparatively very rare. Both carcinoma and sarcoma usually take the form of diffuse growths of various sizes throughout the peritoneum. The primary malignant growths are usually endotheliomata, forming dense plate-like thickenings of the peritoneum.

The benign tumours usually originate in the subserous tissue, and may attain large dimensions; they are usually solitary. The cystic growths are either hydatids, or of serous, hæmorrhagic, or chylous nature, developing between the layers of the mesentery and the omentum, and situated below the umbilicus.

Clinical Course.—The development of malignant growth is almost always associated with marked ascites, and the fluid is usually hæmorrhagic. Large masses are often palpable, and the plate-like masses of endothelioma are most often found in the hypogastrium. As a rule, symptoms referable to the primary growth precede the peritoneal disease, but in some cases it is impossible to trace the origin of the disease.

The solid and cystic growths of the omentum and mesentery are distinguished by their marked mobility; they lie

as a rule about the level of the umbilicus or below it. In about seven-tenths of the cases they give rise to attacks of severe pain, usually associated with constipation. Sometimes the growth of the tumour is intermittent.

Diagnosis.—The presence of a rapidly-increasing hæmorrhagic ascites, which does not diminish under treatment with cardiac and diuretic remedies, and re-collects soon after puncture, is almost diagnostic of malignant disease, and the diagnosis will be confirmed if a primary growth or metastases are discovered. Sometimes tumour elements are to be found in the exudate. Cachexia usually co-exists with the ascites.

In cirrhosis of the liver the exudate is rarely hæmorrhagic, and the spleen is hypertrophied ; the discovery of a primary cancer will distinguish the condition from tubercular peritonitis.

Cysts and solid growths of the omentum and mesentery are very mobile ; pelvic examination will distinguish them from ovarian tumours. If the large bowel is blown up it is found encircling the growth like a collar, and the distended stomach lies above it ; these anatomical points will distinguish it from a pancreatic cyst, and from a cyst of the liver. In children, the question of chronic intussusception has to be considered, but this is associated with a train of symptoms which is absent in the case of omental and mesenteric growths.

INDICATIONS FOR OPERATION.

When the condition is one of peritoneal cancer the only justifiable procedure is puncture and removal of the fluid if asphyxia threatens.

When a tumour is present which appears to have had its origin in the omentum or mesentery, operation is unconditionally indicated : (1) When the tumour is growing rapidly ; (2) When severe pain, repeated vomiting, and perhaps slight fluid effusion and meteorism suggest torsion of the pedicle, or, in the case of cystic growths, suppuration ; (3) When the discovery of cystic swellings in other organs points to the hydatid nature of the growth.

The only contra-indications to operation in the case of large solid growths of the omentum and mesentery are such as would discountenance laparotomy in general. The

solid growths are removed entirely; the cystic growths are either dissected out, or, if this is impossible, incised, sutured to the abdominal wall, and drained.

PROGNOSIS.—*Results of operation.*—The drawing off of fluid is a palliative measure which often gives very great relief to the patient. In the case of cystic and simple solid growths operation is often very successful; of 40 such cases 27 were permanently cured (67 per cent).

Risks of operation.—The statement that by the drawing off of hæmorrhagic effusion a risk is run of severe consequent hæmorrhage, is not supported by my own experience, and is, at any rate, not to be feared as much as some writers appear to suggest. In one case of endothelioma I observed an implantation metastasis develop in the puncture track.

In the course of extirpating a tumour the mesenteric vessels may be injured and the bowel deprived of its nutrition; under such circumstances resection becomes necessary.

When a cyst is drained the sinus may persist for a long time, as long as a year in some cases; the scars left are often troublesome, and ventral hernia frequently results.

The prognosis of operation differs much (Blum), according as it is done at the time when intestinal obstruction is present (31 per cent of recoveries), or during quiescence of symptoms (75 per cent of recoveries). Death may occur from shock or sepsis.

Without operation.—Abundant and increasing ascites presses on the diaphragm and causes asphyxia. If torsion of the pedicle of a tumour occurs, and extirpation is not proceeded with, necrosis and fatal peritonitis may supervene. In the case of hydatids and other cysts, suppuration and septicæmia, or rupture and peritonitis, are always to be feared.

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ASCITES.

Etiology and Pathological Anatomy.—Fluid collections in the abdomen of a non-inflammatory nature occur as a result of obstruction to the portal circulation, as in portal thrombosis and hepatic disease, or as part of a universal dropsy from cardiac and renal disease, or in general cachexia. A non-inflammatory ascites also occasionally occurs in young girls before the onset of menstruation. The fluid is usually of a light yellow colour and clear, its specific gravity 1005 to 1015, and contains a relatively small amount of albumin: from ·1 per cent to a maximum of 2·5 per cent, usually less than 1 per cent. In chylous ascites there is fat in the fluid, giving it a milky appearance, due to rupture or obstruction of lymphatic vessels.

Clinical Signs.—The presence of free fluid in the peritoneal cavity is shown by dullness in the dependent parts, which varies as to its limits with changes in the position of the patient. When the amount of fluid is large a fluid wave is to be felt on percussing the abdomen. The distension of the abdomen is uniform, the umbilicus protrudes, the abdominal wall is often œdematous, and its veins are dilated. If there is some general affection of the circulation there is usually œdema of the legs in addition to ascites, and this is also often present when the ascites is due to renal disease or general cachexia. When the diaphragm is pushed upwards by a large collection of fluid a serious embarrassment of respiration results.

Diagnosis.—The clinical signs just mentioned are as a rule sufficiently clear to establish the diagnosis. The absence of meteorism, pain, and tenderness to pressure, exclude peritonitis. Vomiting may be frequent even in ascites due to circulatory disturbance. When the fluid is present in small quantity it may be difficult to detect; examination in the half upright position, and palpation by the vagina or by invaginating the scrotum, may be useful under such circumstances.

Cases occur of fluid collections in enormously dilated intestine which may be difficult to distinguish from ascites; but the observation that in the latter the fluid changes its position when the patient is moved, and makes its way to whatever is the most dependent part for the time being, will usually make the condition clear, and careful examination on the same lines will also differentiate cystic tumours, an enlarged uterus, and a dilated bladder.

INDICATIONS FOR OPERATION.

Operative treatment for ascites, with the exception of Talma's operation, which is discussed in the section on cirrhosis of the liver, is confined to puncture with the trocar or permanent drainage through cannulæ. Withdrawal of the fluid is justified under the following circumstances: (1) When the fluid is present in such amount that asphyxia is threatened; (2) When a large ascites remains stationary or increases, in spite of medical treatment; (3) In cardiac and renal disease, when the heart is embarrassed and diuretics fail to relieve; (4) In pure hepatogenous ascites and in its earlier stages, without waiting for the effect of diuretics.

Permanent drainage is comparatively rarely necessary; it is indicated (Truc) when the fluid rapidly reaccumulates after puncture, and when a fistula becomes established at the point of previous puncture.

Contra-indications.—It is advisable to avoid puncture, if possible, when some inflammatory affection of the abdominal parietes or other parts of the body is present. Erysipelas of the extremities is not uncommon in general dropsy. A tendency to gastric and intestinal hæmorrhages also contra-indicates tapping, as intense distension of the abdominal vessels always follows the proceeding. If the general

condition is very bad, puncture should be repeated as infrequently as possible on account of the loss of albumin. The ascites of young girls does not call for tapping; it may disappear spontaneously when menstruation begins.

Prognosis.—*Results and risks of abdominal puncture.*—In cirrhosis of the liver, permanent relief sometimes follows several tappings if appropriate dietetic treatment is instituted at the same time. Circulatory compensation may follow the relief given by tapping in diseases of the heart and kidneys. In a case of mitral stenosis and incompetence under my care the abdomen was tapped for the relief of intense dyspnœa, and for several years afterwards there was no return of the ascites. Sudden severe collapse may follow tapping if the precaution of moderately compressing the abdomen afterwards is not taken. Even when tapping is done with careful aseptic precautions a non-purulent peritonitis may ensue after it has been done several times. The deep epigastric artery has occasionally been wounded The puncture hole sometimes leaks for several days; eczema of the surrounding skin and secondary infections occasionally occur.

Prognosis without puncture.—Although a patient with ascites may live long, the condition remains always a great menace to life if unrelieved; œdema of the lower extremities supervenes, and the heart becomes embarrassed. Hernia may occur from diastasis of the recti; occasionally ascitic fluid makes its way to the exterior through the umbilicus; I have twice seen this occur without untoward result.

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SUBPHRENIC ABSCESS.

Etiology.—Subphrenic abscess is caused by inflammatory affections of the abdominal cavity, appendicitis, disease of the genital organs, cholecystitis, hepatic and splenic abscess. Many cases are due to chronic perforation of gastric and intestinal ulcers. In rare cases it occurs in the course of a general septic infection or as a result of trauma.

Pathological Anatomy.—The abscess may be intraperitoneal or retroperitoneal; it may reach large dimensions, and may be loculated. It is often connected by fistulous tracks with other intra- or extraperitoneal purulent collections. The pus may make its way into the pleural cavity, and there set up a subpleural abscess or an empyema, or a pneumothorax. Rupture into the lung and discharge through a bronchus is also fairly common. The pus often has a fæcal odour, and the abscess frequently contains air. The condition is often bilateral; perforation of the diaphragm may occur at several separate points. Subphrenic suppuration secondary to a suppurative process in the thorax is extremely rare.

Abscesses on the left side are usually connected with the stomach, abscesses on the right with the appendix, the liver, or the duodenum.

Clinical Course.—The symptomatology of subphrenic abscess is extremely variable. As a rule the temperature is high; pain may be complained of over the lower ribs, but is often entirely absent. The diaphragm is usually considerably pushed upwards; the liver and spleen are commonly depressed, the heart dislocated upwards, and to the side. When the abscess is on the right side the liver dullness is often continuous upwards towards the axilla in the form of an arc, declining towards the back. A sign of much importance is œdema of the overlying soft parts, particularly common when the abscess is retroperitoneal.

Diagnosis.—The condition will always be suspected when relief is not afforded by the local treatment of suppurative foci in the abdomen, especially suppurative appendicitis. When the general symptoms of such affections persist, the physical signs of subphrenic suppuration will be sought for, and if found, in association with marked

leucocytosis, the diagnosis is practically certain. Radiographic examination will prove of value. Strong corroboration will be afforded by the presence of cutaneous œdema.

Air in the abscess will give characteristic physical signs, similar to those of pneumothorax.

If rupture takes place into the thoracic cavity and symptoms of pneumothorax develop, the diagnosis will be clear. Sometimes a subphrenic abscess is associated with a serous pleural effusion.

Lately a young man was admitted to hospital under my care with high fever. At the base of the chest behind there was dullness and diminished breath sounds, and on puncture here a sterile serous exudation was removed. As there was some tenderness on pressure and slight resistance in the region of the left kidney, I made a diagnosis of perinephritis and probable subphrenic abscess, with secondary serous pleurisy. The resistance became more marked, the fever persisted, and the soft parts in the loin became œdematous. Incision was made here, and more than half a litre of pus was evacuated, the abscess extending upwards into the dome of the diaphragm. The patient recovered.

In view of such cases, when a subphrenic abscess is suspected, puncture should be made in the lower spaces if serous fluid is first obtained above; I have several times demonstrated an abscess in this manner.

It is sometimes very difficult to differentiate between subphrenic pyopneumothorax and an encysted pyopneumothorax at the base of the lung; the history of the earlier symptoms, whether they have been abdominal or pulmonary, must be enquired into. A liver abscess which does not contain gas, and which is situated close under the diaphragm, cannot be distinguished from a subphrenic abscess with certainty, and the two are in fact often associated.

INDICATIONS FOR OPERATION.

As soon as the diagnosis is made of a purulent inflammation which may lead on to subphrenic abscess, operation is urgently called for If the patient already presents signs of subphrenic abscess when first seen, it is necessary to freely open the collection at once and drain it. The incision will either be carried through the pleura or will be made

below the costal border, according to the situation of the abscess.

Since it has become the habit to treat cases of suppurative appendicitis and other abdominal suppurative affections by early operation, subphrenic abscess has become much less common than previously. Its best treatment is prophylactic.

It must not be forgotten that bilateral abscess is not rare, and that after one side has been opened suppuration may continue to extend on the other side, necessitating a second incision.

Contra-indications.—Subphrenic abscess is associated with such grave risk to life that operation is only contra-indicated if the patient is actually moribund. Perhaps in an extremely feeble patient it is legitimate to temporize if pus is discharging by the bowel, but the collection usually forms anew and gives rise to dangerous complications again.

Prognosis.—*Results of operation.*—Operation is often successful in saving life in subphrenic abscess ; when there is a pneumothorax, or a fistula between intestine and bronchus, or some other complication involving the thoracic organs, operation usually palliates but does not cure. Other suppurative foci are often associated with the subphrenic collection, and the opening of the latter may be followed by no improvement if others persist.

In a young girl under my observation appendicitis was followed by a slowly progressive purulent peritonitis. The clinical signs pointed to a right-sided subphrenic abscess, and a second larger collection to the left side of the urinary bladder. The right subphrenic abscess was opened by the surgeon, and another large abscess on the left, apparently not subphrenic. The girl improved, and the temperature fell. On the sixth day there developed intense dyspnœa, and death followed. The autopsy showed that a small subphrenic abscess had ruptured into the left pleura, and that this abscess cavity communicated with the other abscess on the left side, which had been opened, by a fistulous track.

On the other hand, a subphrenic abscess, even when associated with severe complications, may be successfully dealt with by operation. In a recent case which I saw, a subphrenic abscess, apparently originating from the liver,

ruptured into the left pleura, and produced a large empyema ; three ribs were excised, the empyema was drained, and the patient recovered. In general the prognosis depends upon the condition of the patient, the size of the abscess, the nature of the original disease, and the complications present. In 60 cases operated on by Körte 40 recovered, 20 died. Of 75 cases collected by Maydl 35 died (47 per cent). The least favourable cases are those in which the intestine (except the appendix) is the point of origin of the abscess. In addition to the danger of collapse, there is a risk of infecting the general peritoneal cavity if adhesions are torn during operation.

Without operation.—In rare cases spontaneous recovery has followed after rupture of the abscess into the bowel, the exterior, a bronchus, or the stomach. Thoracic complications are the cause of fatality in many cases; in others general pyæmia is the cause of death.

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CHAPTER XVIII.

Diseases of the Gall-Bladder and Bile-Ducts.

Chapter XVIII.

DISEASES OF THE GALL-BLADDER AND BILE-DUCTS.

CHOLELITHIASIS (GALL-STONES).

Etiology.—The formation of gall-stones is favoured by stasis of the bile; micro-organisms, and particularly the *Bacillus coli*, play a part in their production, and probably reach the gall-bladder from the intestine. The affection is more common in women than in men; it is rare in childhood, and becomes steadily more frequent as advanced age is approached. Tight clothes, particularly corsets and belts, appear to play some part in etiology; also pregnancy, a sedentary life, and the feebleness of abdominal muscles found in old age. Another apparent causative factor is the uric acid diathesis, and many authors have credited heredity, atheroma, and incontinent habits of life with a similar influence. In rare instances foreign bodies have reached the biliary channels and have caused gall-stone formation. Attacks of colic may be set up by injury, and possibly also by emotional influences.

Pathological Anatomy.—Gall-stones are formed in the gall-bladder and are most often found there, but also in the cystic and common bile-ducts; stones of secondary formation are not uncommonly found in the intrahepatic bile-ducts. Usually the stones are multiple and faceted, but it is not unusual to find a single stone; this may reach the size of a walnut, and it is usually rough on the surface. When a single calculus is lodged in the neck of the bladder it often attains large dimensions; when a stone is thus lodged other stones often form within the bladder, but only rarely forwards in the cystic duct. Stones appear to form in batches; the gall-bladder itself may meanwhile be little

changed, but when an " attack " occurs there is inflammatory swelling of the mucous membrane, with effusion of serous or purulent fluid. Inflammation of the gall-bladder may be serous, seropurulent, purulent, septic, or diphtheritic; it often spreads to surrounding parts, and adhesions form which interfere with the flow of bile, particularly by causing kinking of the cystic duct. In recent inflammation the gall-bladder is distended, often cucumber-shaped, and the walls are thinned; repeated attacks lead to cicatricial shrinking. After the passage of calculi the cystic duct may remain enormously dilated, or may be constricted and even obliterated by the cicatrization of ulceration; ulceration may lead to the formation of a choledochoduodenal fistula.

The gall-bladder may entirely get rid of its stones by the ducts into the intestine, and the affection be spontaneously cured. Not uncommonly chronic perforation of the bladder, more rarely of the cystic duct, takes place, with the formation of an intestinal fistula; occasionally a fistula is connected with other organs; acute rupture into the peritoneal cavity is rare.

If a stone remains a long time in the neck of the gall-bladder an inflammatory hydrops occurs, or, in case of infection, an empyema. In 183 cases of stone in the bladder neck and cystic duct, operated on by Riedel, there was bile in the bladder in 27, and serous or purulent fluid in 156. When a stone is lodged in the common duct, inflammatory affections of the surrounding structures are not uncommon; in particular, chronic pancreatitis and thrombosis of the portal vein; the bile-ducts above may also be infected, leading to an infective cholangitis and liver abscess. In purulent cholangitis inflammatory changes are often found in distant organs: the kidney, the endocardium, and the lung (abscess). In old-standing cases of cholelithiasis, carcinoma of the gall-bladder is often found at autopsy.

Clinical Course.—In many cases gall-stones cause no symptoms. Often there is only a dull pain, which the patient refers to the stomach. The attacks of colic are characteristic, sometimes mild in type, sometimes agonizing; their intensity bears no relation to the extent of the affection present; they are localized in the region of the gall-bladder. In this region also there is tenderness on pressure, and often

a tumour. As a rule, vomiting accompanies the attacks. If the bladder is infected there is fever, often intermittent in type, and frequently there are signs of the spread of the inflammatory process to surrounding parts: meteorism, constipation, and perihepatic friction. Jaundice is absent in most cases of gall-stone colic, but if the stone reaches the common duct it is usually present along with enlargement of the liver; this, however, is not always the case even with large stones. When a stone is long impacted in the common duct the jaundice is intense, fever is often pronounced, and in late stages there may be hæmorrhages from the mucous membranes. When the common duct is thus blocked, the gastric and intestinal functions are interfered with, and when the condition is prolonged the patient's general state of health suffers very much.

It is not common for stones to be evacuated through the intestine; if such a stone is larger than a cherry-stone it will probably have made its way through a fistulous opening into the intestine; such fistulæ may develop early or late in the progress of the disease, and may give rise to no particularly troublesome symptoms.

The intervals between attacks of colic are variable; frequently an interval is as long as a year. If during this time the cystic duct is blocked and the inflammatory reaction subsides, a painless distended gall-bladder may persist, but in many such cases the tumour which is present in the early stages subsides and disappears after a few days. Riedel distinguishes between the "unsuccessful" attacks, in which the stone does not pass beyond the cystic duct, and the "successful," in which it reaches the common duct or the intestine.

Diagnosis.—In a period of quiescence diagnosis may be impossible if there is no exact history, as local signs may be entirely wanting; but often it is possible to elicit tenderness over the gall-bladder when an attempt is made to press up the liver during inspiration. The history is often characteristic; if the patient tells a story of attacks of pain in the stomach region, accompanied by vomiting and jaundice, which have been going on for a year or more, the condition is in all probability cholelithiasis. The diagnosis is made clear by the discovery of calculi in the fæces, or by the presence of a painful pyriform tumour in the gall-bladder

region. Such a tumour may have a characteristic mobility, pressure with the hand causing it to disappear, to reappear shortly in its former position; it is often hard, but I have never been able to make out the grating of the calculi on each other so often described by writers. Exploratory puncture is inadvisable, owing to the risk of infecting the peritoneum. Biliary calculi have hardly ever been demonstrated by radiograph.

General diagnosis is not all that is necessary; an attempt must be made to diagnose the exact local condition present; the following points are based on the descriptions of Kehr :—

Acute obstruction of the common duct is characterized by the appearance of intense jaundice following or during a typical attack of colic associated with vomiting, often with fever, and the radiation of pain to the chest and back.

In chronic obstruction of the common duct there is often no enlargement of the gall-bladder and liver; the former is, in fact, often shrunken; there is intermittent fever. Jaundice and decoloration of fæces vary in degree from time to time; the patient usually complains of a dull epigastric pain, and the spleen is often enlarged. Cachexia is frequently present and a tendency to hæmorrhage from the mucous membranes.

In acute cholecystitis of a gall-bladder previously more or less normal, a tumour forms; there is no enlargement of the liver, but a tongue-like process of liver substance (Riedel's lobe) may project downwards in front of the gall-bladder. Jaundice is present in only about 10 per cent of cases; when this jaundice is associated with a palpable gall-bladder tumour it is usually, according to Riedel, inflammatory in origin and nature. There is always acute pain and tenderness, sometimes peritoneal friction, and usually fever, with general constitutional disturbance.

Acute cholecystitis of a shrunken gall-bladder is usually associated with obliteration or constriction of the cystic duct, and the presence of multiple adhesions around the bladder. As a rule, there is no gall-bladder tumour and no jaundice, but there is definite local tenderness to pressure. When there is a collection of pus in the bladder there is usually high fever, and when the affection is of a severe type it will be associated with rigors and pronounced symptoms of septic intoxication.

Empyema of the gall-bladder associated with calculi is characterized by the presence of a tender swelling in the gall-bladder situation, and subjective pain referred chiefly to the same spot. Fever and rigors commonly, but not invariably, occur, and often there are signs of a local peritonitis, with meteorism, vomiting, slight ascites, and perihepatic friction. As a rule, the calculi do not pass into the intestine.

Acute perforation of the gall-bladder gives rise to sudden excessively severe local pain, with collapse, rapid pulse, and subnormal temperature. The abdominal wall is rigid, and after a time some distension appears and there are signs of free fluid in the peritoneal cavity.

In a patient of mine, about 30 years of age, the family medical attendant had for several years suspected gall-stones, and several courses of treatment at Carlsbad had been undergone. Finally, the pain becoming much worse, and being associated with fever, he came from Roumania to Vienna. When seen he had had fever for fourteen days, ushered in by a single rigor; there was a firm, tender swelling in the gall-bladder region, no jaundice, no ascites, no collapse. Immediate operation was advised, but was not agreed to until eight days later, when the general condition was worse and the pain intense, though not exactly insupportable. At the operation a perforation of the gall-bladder was found, the resulting peritonitis being localized by adhesions. Both within and outside the gall-bladder there were numerous calculi, small and large, and a quantity of fœtid pus. The patient recovered.

Chronic obstruction of the cystic duct is characterized by hydrops of the gall-bladder forming a cystic tumour; the most common symptom is an indefinite epigastric pain. There is no enlargement of the liver or jaundice. A "Riedel's lobe" is often present.

The groups of symptoms which have been mentioned are those which are generally characteristic of the lesions noted, but they must not be looked upon as absolutely diagnostic of these particular lesions.

In general it should be noted that the presence of a distended gall-bladder in a first attack points to a severe inflammatory condition of the bladder which may be serous or purulent. A distended gall-bladder in a case of chronic

recurrent cholelithiasis usually means a serous exudation if there is no jaundice; more rarely an empyema. If jaundice is present in such a case it will be of the "infla m-matory" type, and in either case there will be a calculus in the cystic duct or the neck of the bladder. The disappearance of a gall-bladder tumour when jaundice persists or increases indicates the passage of the obstructing calculus into the common duct towards the duodenum. Intermittent fever with rigors may be associated with calculus in any situation, and points to the occurrence of suppuration.

Differential Diagnosis.—In an attack of colic the question will arise as to the possibility of its being of renal origin. Renal colic is distinguished by frequency of micturition, scanty urine, rectal tenesmus, radiating pain along the ureter to the glans penis, and tenderness on pressure over the kidney and often along the ureter.

In appendicitis the situation of the pain and tenderness is lower in the abdomen and more lateral; dullness on percussion, if present, is in the right iliac fossa, and the enlarged appendix can often be felt.

In intestinal colic meteorism is often present, and pressure on the abdomen lessens the pain, which passes off with intestinal gurgling; if there is actual bowel stenosis there will be excessive peristaltic movements.

A movable kidney will be distinguished by its shape, but a hydronephrotic kidney may resemble the outline of a distended gall-bladder. Such a renal tumour can often be pushed upwards under the liver, and is obscured by distension of the colon and small bowel, whereas a gall-bladder tumour remains prominent under these conditions. In tumours of the stomach and pylorus the diagnosis will be assisted by inflating the stomach, by chemical examination of the stomach contents, by attention to the history, and by the presence of exaggerated stomach peristalsis. Hydatid cysts of the liver can usually be distinguished by the history of a slow-growing, painless tumour, associated with a relatively good general condition and the probability of echinococcus infection.

Tumours of the omentum when displaced with the hand do not usually return to the same spot in the way that is characteristic of gall-bladder tumours.

Carcinoma of the gall-bladder and liver is distinguished

from cholangitis by the intense hardness of the tumour present in the gall-bladder region and by the onset of ascites.

Sometimes hysterical gastralgia may be simulated by gall-stone colic, with obstruction of the cystic duct, as in a case under my care, in which the pains due to calculus were for several years ascribed to the former condition.

INDICATIONS FOR OPERATION.

There is a considerable amount of disagreement as to the indications for operation in cases of gall-stone disease. There are many who disagree with Winiwater's view, that the presence of gall-stones constitutes in itself a sufficient indication for operation, and, in view of the many cases in which calculi cause no symptoms, this opinion is certainly extreme; Körte's opinion is that the necessity for operation should be judged from the type and degree of inflammatory disturbance caused by calculi, either periodically or persistently.

Riedel advocates early operation; he considers that an attack of colic calls for operative interference if no small stones are evacuated, either during or immediately after the attack; but as many patients have only a single attack, and without getting rid of calculi have no further troubles of the kind, in the opinion of many physicians, including myself, such a single attack is not a sufficient indication. Signs of infection may follow operation in cases which had been free from any such signs before. Riedel's statement that nine-tenths of cases of gall-stones require operation, requires more evidence to support it than has yet been advanced. Kehr holds that there is an absolute indication for operation under the following conditions: (1) In acute purulent cholecystitis and in chronic obstruction of the cystic duct, internal treatment being useless in either case; (2) In persistent colic, or continuous pain, when internal treatment gives no relief, particularly when it renders the patient unfit for work, or if the patient has developed morphine hunger and himself desires operation; (3) When a firm gall-bladder tumour gives rise to a suspicion of carcinoma, and when there are signs of perforation or suppuration in the surrounding parts.

The first of these indications is incontestable; and operation is called for also in the cases of "quiet" common duct

obstruction, characterized by chronic jaundice without fever, loss of flesh, and absence of bile from the stools following an attack of colic; and equally in common duct obstruction complicated by infection. When suppuration is suspected, a rapidly increasing leucocytosis indicates early operation, and this is specially important in relation to the chronic apyrexic empyema of the gall-bladder. Kehr's second indication is of special importance in dealing with the working classes, and with patients on whom the affection has a specially marked effect, physically or morally. In such cases it may be necessary to operate even when the diagnosis is not very clear. Operation must always be advised in these patients when, in addition to pain, there are signs of gastric stasis from obstruction at the pylorus, a state of affairs which will increase in severity if left alone. Regarding the third class, Kehr himself is somewhat doubtful as to the indications to be based on a probably cancerous tumour; by the time such a tumour is discovered the time for successful removal has, as a rule, passed.

With regard to the time for operation in persistent jaundice, Ewald's opinion should be borne in mind, that operation should never be delayed more than a month; if it is put off longer the prospect of healing becomes bad, there is risk from hæmorrhage, sutures tear through, and adhesions do not form.

Operative Methods.—When the wall of the gall-bladder is sound, cystostomy is performed either in one or, less commonly, in two stages, and the calculi are removed from the bladder and the cystic duct. When a stone is in the cystic duct the duct itself has often to be incised. Cystectomy is a more dangerous procedure; it is necessary when the gall-bladder is shrunken, brittle, or fistulous, whether there are calculi within it or not, and when the cystic duct is obliterated, or has been long obstructed by a stone. Cholecystenterostomy is sometimes called for in cases of chronic obstruction of the common duct when the duct is inaccessible. Suppuration around the gall-bladder may be dealt with in one or two stages, the pus being first evacuated, and the gall-bladder itself being opened later. In chronic obstruction of the common duct choledochotomy, with drainage of the hepatic duct, is called for; this is the most difficult of the operations on the bile-ducts. In

almost all operations on the bladder and ducts drainage is necessary.

Contra-indications.—When the condition causes little pain, and attacks of colic are infrequent, no operation is necessary. In frequent slight attacks, associated with jaundice, and the successive passage of several small stones, it is well to temporize, particularly if the patient is free from pain between attacks. The presence of ascites contra-indicates operation for gall-stone disease, as also diabetes, extreme obesity, advanced arteriosclerosis, and cardiac or serious pulmonary disease. Advanced age is not an absolute contra-indication. Acute obstruction of the common duct (see under *diagnosis*) may terminate after several weeks in recovery, and, therefore, one should wait in such cases. Intense jaundice of some months' duration, with or without hæmorrhage from mucous membranes, contra-indicates operation on account of the great risks of serious parenchymatous hæmorrhage, particularly in old people. Advanced cancer of the biliary passages forbids operation; several cases of my own, with only moderate infiltration of the liver around, have died the day after operation.

Risks of operation.—The mortality varies much according to what operation is necessary. Kehr's mortality in 720 cases is 15·5 per cent. The least dangerous are the conservative operations: cystostomy, cysticotomy, cystendysis, with 2 per cent, then extirpation of the gall-bladder, with 3 per cent. Choledochotomy was attended by a 6·5 per cent mortality in 137 cases. Among cases in which operations had to be done at the same time on other organs (stomach, intestine, pancreas, etc.), or in which there was some serious complication, the proportion of deaths was very high: ninety-three in 191 operations. Mortality is specially high when carcinoma or diffuse cholangitis complicates the disease.

In many cases an exact diagnosis is impossible, and one is often unable to foretell the risk of operation because, until the abdomen is opened, it is not certain what particular operative procedure will have to be undertaken.

Sometimes biliary fistulæ persist for a long time, but they almost always heal eventually. Operation has sometimes to be repeated for stones left behind, or for adhesions, causing kinking of the cystic duct, and profuse

mucous secretion. Recurrent hæmorrhage may call for a second operation, and sometimes torsion of the pylorus and duodenum makes it necessary to reopen the wound. Ventral hernia is common.

When choledochotomy with hepatic duct drainage is the operation done, Kehr mentions three comparatively common complications : (*a*) pneumonia in 8 per cent of cases ; (*b*) acute dilatation of the stomach, with vomiting, and sometimes diarrhœa (lesions of the mesenteric arteries), (*c*) hæmorrhage into the stomach and intestine, and hæmatemesis, which can sometimes be checked by washing out the stomach and other treatment.

Prognosis.—*Results of operation.*—In very many cases opening the gall-bladder and removal of the stones result in complete and permanent recovery. Even after long-continued high fever from a severe infection of the biliary passages, complete restoration to health may follow operation. In one such case under my care high fever had been present for some weeks, and severe septic absorption ; pus was found in the gall-bladder and came freely from the cystic duct; the patient recovered completely (of course after a long illness), after the removal of a large number of calculi from the gall-bladder, and the spontaneous discharge of others. Still better are the results of total extirpation of the gall-bladder and drainage of the common duct. When this operation is done it is rare for stones to be overlooked and cause subsequent trouble.

The possibility of a true re-formation of calculi after operation is admitted by all authors, but such an event is rare. Stones left behind will, of course, cause trouble later. Sometimes they form round silk sutures left in the bladder. Almost always recurrence of symptoms is due to stones overlooked, and although this happens from time to time, it is of no importance as an argument against surgical treatment when the indications are clear ; defective technique, or the difficulties of the operation, are responsible for the accident ; it is well to bear in mind the possibility of its occurrence when stating the prospects of the operation to the patient. Other troublesome eventualities may follow operation, in particular, the development of adhesions, which, as in one of my cases, may make the last state of the patient worse than the first. In many of my cases operation

has given perfect results; occasionally stones overlooked have necessitated a second operation, but all such cases have recovered.

Without operation.—In most cases gall-stones do not lead to any condition threatening life, and in this respect the prognosis is relatively good. It is necessary to insist on this fact, because several authors have written of the condition as if it usually produced serious lesions, and have expressed in consequence much too comprehensive a view of the necessity for operation. According to my own experience, and that of several other clinicians, expectant treatment gives a very low mortality: about 4 to 5 per cent. Other writers, on the basis usually of a relatively small material, take a more serious view, thus Binder in 96 cases, 52 of which were kept under observation for a long time, recorded eleven deaths. The most serious complications and eventualities have been noted above. Carcinoma of the gall-bladder is one of the possible results of gall-stone disease not operated on. Unfortunately this occurs just in those cases in which the calculi have given rise to no symptoms.

The onset of complications (suppuration, long-continued jaundice, peritonitis, and perforation) increases the gravity of the prognosis. Although the affection rarely ends in recovery without operation, there is no doubt that, in many cases, except those presenting urgent symptoms, the regulation of diet, and treatment with mineral waters, is able to produce a latency of symptoms satisfactory to the patient and his medical attendant.

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CHOLELITHIASIS (ASSOCIATED CONDITIONS).

(A.) HYDROPS OF THE GALL-BLADDER.

Etiology.—This condition is caused by obstruction of the cystic duct by stone, scar, or kinking. Often also it is present as a complication when a malignant tumour involves and compresses the cystic or common duct.

Pathological Anatomy.—The gall-bladder is often enormously dilated, and the wall much thinned in parts; it is filled with a colourless ropy fluid.

Clinical Course.—Hydrops of the gall-bladder is only a complication of other morbid processes. A spherical or pyriform swelling presents below the lower border of the liver, it moves with respiration, and often can be displaced with the hand, but returns to its original situation. It is not tender to pressure, in consistence it is elastic, but fluctuation cannot, as a rule, be made out. When the

primary cause is a malignant growth, ascites and jaundice may be present. When the gall-bladder is enormously distended it is liable to be confused with other cystic abdominal tumours. Ovarian cysts are distinguished by their pelvic origin and attachments; a hydronephrotic kidney comes forward from the loin, and is liable to sudden variations in size. A pedunculated hydatid cyst of the liver is difficult to distinguish from a distended gall-bladder except by its slow growth. A movable kidney presents the characteristic renal outline, and can be replaced in the loin. I am aware of a case of distended and very movable gall-bladder which was mistaken by several observers for a hydronephrotic and mobile kidney, the true nature of the condition being only discovered at operation.

INDICATIONS FOR OPERATION.

A distended gall-bladder which is not due to inflammatory causes only calls for operation when the distension develops rapidly and threatens rupture, or when it interferes by pressure with the functions of neighbouring organs, and causes serious symptoms, such as repeated vomiting, a troublesome sense of fullness, and intestinal disturbance. When operation is necessary the abdomen is opened, and a fistula is established; puncture without opening the abdomen is unjustifiable, on account of the risks of leakage.

Contra-indications.—When the condition which causes the distension is irremediable by operation (new growth about the hilum of the liver), and when the distension itself is not extreme, no operation should be done. Extreme age, arteriosclerosis, old-standing jaundice, with hæmorrhage from the mucous membranes, constitute contra-indications.

If no operation is undertaken, and the distension increases rapidly, the gall-bladder may rupture and fatal peritonitis follow; but this accident is rare. As a rule, the condition is of small importance compared with the primary affection which causes it.

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See also Quincke, Langenbuch, Terrier et Auvray, above.

(B.) CHOLECYSTITIS: EMPYEMA OF THE GALL-BLADDER.

Etiology.—Inflammation of the gall-bladder is caused by the invasion of micro-organisms. It is often consecutive to some general infective disease, particularly enteric fever, pneumonia, dysentery, and pyæmia. Other common causes are calculi, foreign bodies (intestinal worms), and any condition which causes constriction of the bile-ducts.

Pathological Anatomy.—Cholecystitis is usually associated with cholangitis. When the condition is recent, the gall-bladder is usually dilated; when it is of old standing the bladder is often shrunken. The bladder contains either a mixture of bile and mucus, or pus. When the wall ulcerates, perforation not uncommonly follows; usually in such cases there are adhesions around, and perforation occurs into a preformed localized cavity; under such circumstances a vesico-intestinal fistula may be established later.

Clinical Course.—Tenderness on pressure and enlargement of the gall-bladder are the cardinal symptoms of cholecystitis. There is also subjective pain; the tenderness is particularly noted when pressure is made over the gall-bladder on deep inspiration. The distended gall-bladder is often distinctly pyriform in shape, but adhesions to the omentum may render its outline quite indistinct; often it may be made out to move with respiration, but not always. There is frequently either continuous or remittent fever, and sometimes it is definitely intermittent. When the cholecystitis is of a severe type, vomiting, meteorism, and temporary intestinal paresis are often present, and there is much general disturbance. When jaundice supervenes it is evidence of cholangitis, and its intensity will vary with the extent of the latter.

Diagnosis and Differential Diagnosis.—If the cardinal symptoms are present, if there is a history pointing to cholelithiasis, or if the symptoms develop in the course of an attack of typhoid fever, the diagnosis presents no difficulties.

Perforation may often be recognized by a sudden aggravation of pain, accompanied by vomiting, increased pulse-rate, low temperature, and collapse. In most cases the abdominal

walls are intensely rigid, and palpation impossible. Free fluid in the peritoneal cavity can often be made out a few hours after perforation.

The condition is to be distinguished from appendicitis, in which the local signs are prominent in the right iliac fossa, and there is an absence of history pointing to gall-stones; from renal colic, in which there is tenesmus, blood in the urine and oliguria; from chronic perforation of gastric ulcer by an absence of any history of hæmatemesis, and by the immobility of any tumour that is present; and from intestinal tumour and fæcal obstruction by the history, the absence of any marked tenderness on pressure, and the presence of exaggerated peristalsis in these conditions.

INDICATIONS FOR OPERATION.

The gall-bladder must always be opened whenever there are signs of the presence of pus. Operation is especially urgent when the gall-bladder rapidly distends and is very tender to pressure, when there are fever, rigors, and marked leucocytosis, and especially if such a condition occurs after typhoid, because perforation is particularly liable to occur in typhoid infections. Operation must, of course, be done at once when there is reason to believe that perforation has occurred. When the physical signs point to non-purulent cholecystitis associated with cholelithiasis, the indications for surgical intervention follow the same rules as those already given for gall-stone disease.

Contra-indications.—The rules for operation in cases of acute perforation are those which are followed in all cases of perforation of hollow viscera; when the patient is *in extremis* from diffuse peritonitis, operation will only hasten death from shock. Opening of the gall-bladder is contra-indicated when the cholecystitis is only part of a general pyæmic infection, or if it is due to carcinoma involving the bile-ducts.

Unless operation is required to save life, as in acute perforation, it will not be recommended to patients the subjects of diabetes, arteriosclerosis, and other serious organic disease.

Prognosis.—*Risks and results of operation.*—In most cases operation results in complete recovery. Death occurs

in some cases from shock, in others it is due to concurrent disease. Only rarely is there any trouble from persistent biliary fistula.

A case under my care was that of a young woman about twenty years of age. Agonizing pain in the region of the gall-bladder supervened after several days of fever with rigors, and I felt in this situation an ill-defined swelling. The temperature was high, the pulse rapid, there was jaundice and a coated tongue, and free fluid was present in the peritoneal cavity. The diagnosis was cholecystitis and perforation. At the operation there was found to be tubercular peritonitis, with adhesions between the omentum and liver. The patient died next day, and behind the adherent omentum a perforated empyema of the gall-bladder was found.

If no operation is undertaken, there is risk of general peritonitis, either by propagation, by contiguity, or through the medium of a perforation. Empyema may end in septicæmia. When the inflammatory process extends outside the gall-bladder to neighbouring structures, dense adhesions tend to form, and sometimes there are established fistulæ between the gall-bladder and the intestine, or the exterior.

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(C.) INTESTINAL OBSTRUCTION BY GALL-STONE.

Pathological Anatomy.—Gall-stones which cause obstruction find their way into the intestine through fistulæ, usually into the duodenum (28 in 30 cases examined post mortem), rarely into the colon. The stone usually becomes

impacted in the region of the ileocæcal valve, next in frequency in the duodenum and jejunum. Obstruction occurs the more easily if there is already some narrowing of the intestine due to other causes ; sometimes there are signs of a local peritonitis at the seat of impaction ; in other cases a local spasmodic contraction of the gut appears to have determined the seat of the obstruction.

Clinical Course.—As a rule, the attack of obstruction is immediately associated with a previous attack of biliary colic. Often there is a typical history of cholelithiasis, and signs also of definite localized peritonitis around the gall-bladder preceding the appearance of the symptoms of obstruction. When the seat of impaction is in the upper part of the digestive tract, stomach symptoms predominate : frequent bilious vomiting, rapid development of gastric dilatation, marked wasting, absence of meteorism, but, as a rule, obstruction to fæces and flatus, with a retracted abdomen. When the seat of obstruction is lower, pain is the first symptom, tenderness to pressure is only slight, and develops later, vomiting occurs early and soon becomes fæcal, complete obstruction is soon established, but, according to Naunyn, sometimes flatus can pass. Sometimes the calculus is palpable, and the patient, or his medical attendant, may be able to make out its onward passage. If the calculus is arrested in the large bowel there is gaseous distension in the flanks, vomiting and collapse are delayed, and the phenomena of intestinal obstruction are often remarkably intermittent. If peritonitis supervenes the pulse-rate rises, pyrexia appears, the tongue becomes coated, meteorism becomes extreme, and there are signs of free fluid in the peritoneal cavity.

The Diagnosis is clear when obstruction occurs in a patient known to have gall-stones, and immediately following a definite attack of colic. If the seat of obstruction is in the small intestine, the stone may sometimes be palpated, and its arrest at the ileocæcal junction be made out. Of special significance in diagnosis is the presence of obstruction of an intermittent type, and the passage of flatus while the fæcal obstruction is complete and the vomited matter is fæcal. At the end of an attack the calculus may be found in the rectum.

INDICATIONS FOR OPERATION.

Naunyn considers that operation may generally be avoided in view of the relatively slight degree of obstruction symptoms and the fluctuating course of the condition. It is specially necessary to operate when the stone is lodged in the neighbourhood of the ileocæcal valve. Other writers, particularly surgeons, hold different views.

Considering the difficulties in diagnosis, and the possibilities of mistake, it is well to follow the course of treatment recommended by Körte. He advises first the administration of opium, with stomach lavage and enemata ; if at the end of a period not longer than forty-eight hours the vomiting has not stopped, and the abdominal pain and distension persist, then operation should be proceeded with. The abdomen is opened, and the intestine is incised ; occasionally this may be done under local anæsthesia.

Contra-indications.—If peritonitis is established, and the patient's strength already much exhausted, it will usually be wise to abstain from operation. As above stated, it is well in most cases to allow a period of forty-eight hours to elapse before operation, when there are sufficient grounds for believing that the obstruction is due to a gall-stone.

Prognosis.—*Dangers and results of operation.* If only the worst cases are operated on, the mortality is very high ; but, since 1891, earlier operations have been generally undertaken. In 34 cases operated on between 1891 and 1900 recovery followed in more than 50 per cent. The percentage of recoveries in the operated and not-operated cases cannot be compared, because it is the slight cases that are treated by expectant methods, and those which are operated on would probably have gone to swell the fatalities without it.

The causes of death are exhaustion and peritonitis, occurring most frequently when operation is done at a late stage.

Without operation.—Schüller gives 44 per cent recoveries in 150 cases ; Courvoisier, 56 per cent in 125 cases ; Kirmisson and A. Borchard record a 70 per cent mortality in 105 cases. In cases where the stone is passed death may follow from intestinal ulceration and diarrhœa, or perforation ; the consequences of ulceration may give rise to troublesome symptoms.

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CARCINOMA OF THE GALL-BLADDER.

Etiology.—Carcinoma of the gall-bladder is often associated with the presence of gall-stones in individuals above the age of forty.

Pathological Anatomy.—Carcinoma may develop in any part of the gall-bladder, and tends to extend early to the liver either as a diffuse infiltration or in the form of secondary circumscribed nodules. The cystic duct becomes involved as the disease advances. Lymphatic glands in the portal fissure are often involved early and encroach on the common and hepatic ducts. The growth is usually of the "scirrhous" type.

Clinical Course.—In many cases the disease in its early stages gives rise to no symptoms, the latter making their appearance first when the liver is involved. Localized subjective pain is an early sign, and associated with it a tender, firm gall-bladder tumour may be made out; hydrops of the gall-bladder is not uncommon. In the earlier stages at any rate the tumour moves with respiration. Jaundice and emaciation make their appearance later and become gradually more marked. The observations of many writers, which my own confirm, go to show that the progress of the disease is usually extremely rapid, and from the appearance of the first symptoms lasts only from a few weeks to a few months.

Diagnosis.—When there is present in the region of the gall-bladder a hard nodular tumour which has the general configuration of the gall-bladder and moves with respiration, there can be little doubt as to its character ; the later signs of infiltration of the edge of the liver, jaundice, ascites, and enlargement of the liver, confirm the diagnosis. The persistence of jaundice associated with a bladder tumour is in favour of cancer and against calculus. The discovery of enlarged hard glands in the neck or elsewhere may aid in diagnosis. Tumours of the pylorus are sometimes only with difficulty distinguished from gall-bladder tumours. X-ray examination with the aid of a shot-loaded catheter may be of assistance, but more important is the examination of the stomach contents as to the presence of hydrochloric acid, and the length of time they are retained ; a digestive leucocytosis is absent in stomach cancer.

INDICATIONS FOR OPERATION.

It is only in early cases that operation can promise good results. Unfortunately, the disease is not usually discovered in its early stage ; occasionally it has been found in the course of a gall-stone operation or some other abdominal operation. Cholecystectomy, with removal of adjacent liver tissue, is only permissible when the disease is confined to narrow limits, when the liver is not yet invaded or only to a very slight degree, and when there are no metastases.

Contra-indications. — A large hard tumour in the gall-bladder region, signs of liver infiltration, metastases, cachexia, ascites, and intense jaundice, all contra-indicate operation. It is obvious from what has already been said that the signs of the disease when discovered are usually sufficient to contra-indicate operation.

Prognosis.—*Results of operation.*—In sixteen cases collected by Laspeyres, eight months after operation only one showed no signs of recurrence, eight had died from recurrence or metastases, three from sepsis and peritonitis. As matters at present stand in regard to diagnosis, the prognosis of operation is bad. In my opinion, the chances of success are such that proposals to operate for gall-bladder cancer should be resisted.

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CHAPTER XIX.

Diseases of the Liver.

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DISEASES OF THE LIVER.

TUMOURS OF THE LIVER.

Etiology.—Many types of liver new growth are congenital, others are metastatic, others primary. Traumata are often etiologically important. Syphilis may give rise to tumours of large size.

Pathological Anatomy.—These tumours are benign or malignant. The benign tumours may be cystic and either solitary or multiple, and if the latter, there may be similar cystic growths in other abdominal organs. The more common benign solid tumours are fibromata, adenomata, angiomata, and syphilomata; these are usually solitary and sharply defined. The malignant growths are primary and secondary carcinomata and sarcomata. Primary carcinoma usually takes the form of a solitary tumour occupying one lobe and often causing great enlargement, but primary cancer may also be diffuse. The secondary cancerous growths are much more common than the primary.

Clinical Course.—The non-parasitic cysts exhibit the same signs and symptoms as the hydatid cysts (*vide infra*). Benign liver tumours grow slowly and are not infrequently pedunculated. They are often tender to pressure, and cause gastric disturbance, and abdominal pain of a sharp, shooting character. The malignant tumours may be buried in the substance of the liver, or present as nodular growths on the surface. The bile-ducts and the portal vein may be compressed, with resulting jaundice and ascites. Cachexia is not uncommonly present in the early stages; metastases are to be expected in the peritoneum, lungs, and pleura. Syphilis often causes diffuse enlargement of the liver, and later, a coarse cirrhosis or large gummatous tumours may be formed which yield to specific treatment.

Diagnosis.—In enlargement of the liver, either diffuse or circumscribed, the history must be enquired into for syphilis; the effect of antisyphilitic treatment and coarse cirrhotic intersection indicates the diagnosis. Gradual growth, fluctuation, and the examination of fluid obtained by exploratory puncture, will point to hydatid cyst. Exploratory puncture is not without risk. Chronic abscess is associated with more or less fever, and has a different history. Cystic liver is a very chronic process and usually painless. Diffuse carcinoma of the liver, which is of no surgical interest, may be with difficulty distinguished from amyloid disease, hypertrophic cirrhosis, and other conditions in which the liver is much enlarged.

INDICATIONS FOR OPERATION.

Operation is but rarely indicated for liver tumours. If there is present a definite pedunculated tumour causing troublesome symptoms, and if there are no indications of its being metastatic in character, an exploratory laparotomy is justifiable for the purpose of removing the growth if the local conditions are favourable.

Contra-indications.—Signs of syphilis contra-indicate operation until antisyphilitic remedies have been given a prolonged trial. Bilateral cystic kidneys associated with signs of cystic disease of the liver contra-indicate operation. No operation will be done when there is reason to believe that the growth is metastatic, when there are multiple growths, when there is serious circulatory disturbance or atheroma, or when the patient is of advanced age.

In one of my cases (a man about forty-five years of age) nodes could be felt on the upper surface of the liver. One day a large amount of reddish pus, containing hæmatoidin crystals, was coughed up, and the size of the liver diminished. Diagnosis—liver abscess, and rupture into the lung. At the operation the liver was studded with numerous large and small whitish hard nodules, and the operation was abandoned. Syphilis was denied, but iodide was administered internally, and in the course of a year his general condition became excellent, and the liver diminished in size.

Prognosis.—*Risks and results of operation.*—Hæmorrhage is a serious risk in any operation for the removal of a liver growth. As a rule an exploratory operation is necessary

before it can be settled whether the growth is removable or not. Benign tumours, fibromata, angiomata, adenomata, and cysts have been successfully removed, and in rare instances it appears that primary carcinoma has been successfully dealt with.

If no operation is undertaken.—Malignant growths of course cause death; benign growths often attain enormous proportions, but are only rarely dangerous to life.

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HYDATID CYST OF THE LIVER.

Etiology.—Hydatid cyst is caused by the entrance by way of the digestive tract of the eggs of *Tænia echinococcus*. The embryo penetrates the walls of the intestine, and is carried to the liver by the portal vein. Hydatid cyst is exceptionally common in some regions, particularly in Australia, Iceland, Pomerania, and Mecklenburg. Women are more commonly affected than men. The multilocular cyst is probably not caused by the same parasite as the common single cyst, and has a different geographical distribution; it is comparatively rare.

Pathological Anatomy.—There is usually a single cyst situated in the right lobe of the liver; it is filled with a watery fluid, and often contains numerous daughter cysts. The fluid is limpid or slightly opalescent, its sp. gr. is 1007 to 1009, and it contains no albumin. When the cyst is situated in the centre of the lobe there is a diffuse enlargement of the organ, but when near the surface it is found as

a circumscribed swelling. Neighbouring organs may be much compressed, particularly the lung, as the cyst is often on the upper convexity of the liver. Rupture into lung, bowel, or peritoneum is not unusual; secondary suppuration is common ; the bile channels are rarely compressed. When there are multiple cysts* the liver is often enormously enlarged and may be of a stony hardness. On section the organ is studded with numerous small cavities, like a Gruyère cheese. The biliary channels are more frequently involved in this form, and jaundice and hydrops of the gall-bladder may develop. Secondary cysts may be found in the lungs and the peritoneum ; suppuration and calcification are not uncommon.

Clinical Course.—Often a cyst produces no symptoms. When of considerable size, the liver is enlarged, but not tender to pressure, and there is no jaundice or enlargement of the spleen. If the cyst can be directly palpated a characteristic thrill can often be felt, fluctuation cannot usually be made out, and often the swelling is intensely hard. When a cyst is very large it produces symptoms by compression of adjacent organs; for example, it may cause dyspnœa, cough, and palpitation by pressure on the diaphragm, and through it on the lung and the cardiac area ; and when encroaching on the stomach it will cause nausea, loss of appetite, and a sense of fullness in the epigastrium. If suppuration supervenes there is high fever of an intermittent or remittent type, with rigors and rapid loss of strength : occasionally, however, there is no pyrexia. Perihepatic friction is usually heard when suppuration occurs, and the pus may rupture into a neighbouring organ or space : pyæmia is relatively frequent as a result of this complication. When a cyst ruptures into the lung, scolices are usually coughed up ; when rupture takes place into the bile-ducts or intestine, the scolices may be found in the fæces. Rupture externally is rare. If some injury ruptures a cyst into the peritoneal cavity, severe peritonitis is set up.

In *Echinococcus multilocularis* jaundice is often the first and persistent symptom. Melanotic jaundice is frequent. The liver is large, hard, nodular, and sometimes

* This form is exceedingly rare, except in certain districts of Germany and Switzerland.

presents many fluctuating spots ; enlargement of the spleen and ascites are common. When the condition is long standing, hæmorrhages often occur ; the fæces are often clay-coloured.

Diagnosis.—The history is often of assistance in regard to the patient's place of residence or his association with dogs. Apart from this the diagnosis will be founded on the chronic nature of the condition, the absence of fever and pain, the presence of an elastic tumour with the characteristic hydatid thrill. When the cyst is subphrenic the upper outline of liver dullness is markedly dome-shaped towards the axilla, the lower thoracic outlet is much widened, and a radiograph will often demonstrate the cyst clearly. Exploratory puncture has frequently settled the diagnosis, but it is a dangerous proceeding and not to be recommended.

The diagnosis of *Echinococcus multilocularis* will be assisted by enquiries as to the patient's residence ; the disease is very chronic in type, and the general condition is relatively good ; the liver is nodular and exceedingly hard in parts ; there is jaundice and enlargement of the spleen, and sometimes fluctuating areas may be discovered.

Acute liver abscess is sometimes distinguished with difficulty from a suppurating hydatid, but the history of the preceding illness will generally clear up the diagnosis. Chronic liver abscess in its fever-free stage has no such close resemblance to a suppurating hydatid. Malignant tumours of the liver develop more rapidly and produce cachexia earlier ; they are usually tender to pressure. A distended gall-bladder has a characteristic site and outline, and is usually associated with attacks of gall-stone colic, either recent or at some earlier period. A hydronephrotic kidney is prominent in the lumbar region, the colon overlies it, and it often shows marked variations in size ; it does not bulge forward the lower costal arches. Pancreatic cysts lie behind the stomach when distended. Ovarian cysts are attached to the genital organs in the pelvis.

A syphilitic liver usually shows deep furrowing of the anterior border, and is seldom associated with such intense jaundice as in multilocular hydatid. Large gummata may simulate cysts, but the diagnosis will be cleared up by antisyphilitic treatment. It is sometimes difficult to

distinguish hypertrophic cirrhosis from multilocular hydatid, but, as a rule, there are not the bosses of various sizes on the liver surface which are characteristic of the latter; the residence of the patient is an important aid in diagnosis.

Sometimes the diagnosis is extremely difficult, as in the following case. A woman, aged forty-five, was admitted into hospital under my care with a rapidly-growing abdominal swelling; in the abdomen there was a freely movable cystic tumour the size of a man's head; it did not move with respiration. The general condition was good, and there was no fever. On distending the colon the growth moved upwards and to the right up against the liver; no connection could be made out with ovaries or kidney. The patient had been operated on twenty-three years before for a "liver cyst," and it seemed probable that a portion of the cyst had been left behind, and it had re-formed. At the operation a large hydatid cyst was found at the point of junction of the right and left lobes of the liver, containing vesicles in part suppurating. The patient had noticed a swelling about the size of a small apple immediately after the first operation; this had remained stationary for twenty-two years, but had lately begun to enlarge.

INDICATIONS FOR OPERATION.

Whenever it seems reasonably certain that a palpable tumour of the liver is hydatid in nature, operation should be advised. Both forms of hydatid are to be treated surgically. Operation may consist of puncture through the abdominal wall with or without injection, opening the cyst with the knife, or enucleation of the cyst. The first-mentioned procedure has been for the most part abandoned; the two latter may be performed in one stage or in two stages. Cysts which are subphrenic in position are often opened through the pleura. Operation is urgent when a cyst ruptures into the peritoneal cavity; when a previously recognized tumour disappears or diminishes in size, it may be consequent on some abdominal trauma, and when this is associated with severe peritoneal symptoms—rigidity, meteorism, fever, abdominal pain, signs of free fluid in the peritoneal cavity—and collapse, the diagnosis of rupture is clear. The appearance of an urticarial eruption will confirm the diagnosis. The patient will often say that he

felt something burst in the abdomen. Operation is also urgent when suppuration occurs in a cyst; this will be shown by the appearance of high fever, rigors, rapid increase in size of the tumour, and increased tenderness to pressure.

Contra-indications.—Exploratory puncture of a hydatid cyst is not a justifiable proceeding; subsequent leaking may give rise to fatal peritonitis, or to diffusion of the hydatids throughout the peritoneum. There are the same objections to puncture with a trocar through the abdominal parietes.

Risks of operation.—Puncture followed by drainage is particularly dangerous; it is attended by a mortality of 28 per cent. Peritonitis has often followed immediately after this procedure. Profuse hæmorrhage may follow enucleation. Operation in two stages and drainage of the cyst is a safe proceeding; all the forty-eight cases reported by Langenbuch recovered.

PROGNOSIS.—*Results of operation.*—Almost all cases of unilocular cyst may be successfully treated by operation. Occasionally there are troubles from ventral hernia or adhesions.

If no operation be done, hydatid cysts tend to suppurate; whether suppurating or not, they may rupture into neighbouring organs. Rupture into the peritoneal cavity is fatal in 90 per cent; rupture into the pleura, fatal in 80 per cent; rupture into the bile channels, in 70 per cent of cases. A suppurating hydatid may cause general septicæmia.

Both types of hydatid are compatible with life for long periods. In the case which I have described above the cyst had been present for twenty-three years.

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ABSCESS OF THE LIVER.

Etiology.—Dysentery is the most common primary cause of liver abscess. The condition may also follow inflammatory affections in any part of the portal system, for example, appendicitis; it may result from direct injury to the liver, wound infection, and pyæmia. Gastric ulceration, inflammatory affections of the gall-bladder and ducts, particularly that consequent on cholelithiasis, may also cause liver infection. A hydatid cyst may become a liver abscess by suppuration. The tropical abscess is the most common type; it occurs much more frequently in men than in women, and is preceded by dysentery.

Pathological Anatomy.—Liver abscesses are single and multiple; 75 per cent of tropical liver abscesses are single. Multiple abscesses result from infection conveyed to the liver by the portal venous system or the hepatic artery or the bile-ducts. An abscess may be acute and surrounded by an area of necrotic liver tissue, or more chronic in type, in which case it is often more or less encapsuled; old abscesses are sometimes in part calcareous. Not uncommonly rupture occurs into some neighbouring structure; this takes place most frequently into the lung (about 10 per cent of cases), following an adherent perihepatitis; rupture through the abdominal wall or into the peritoneum is comparatively uncommon. Some abscesses contain as much as several litres of pus. The solitary abscess occurs five times more frequently in the right than the left lobe; peritoneal adhesions to the site of the abscess are very often absent; the contents are often sterile.

Clinical Course.—Pyæmic abscesses of the liver do not as a rule give rise to any very prominent signs; those which

follow intestinal affections present, on the other hand, a characteristic group of symptoms. There are the general symptoms : prostration, nausea and vomiting, remittent or typically intermittent fever, and rigors ; and the local symptoms. The liver is enlarged, either as a whole or in one particular direction ; if the abscess is near the convexity the enlargement upwards is dome-shaped in the direction of the axilla. There is usually pain, referred to the region of the liver, and the organ is also often tender to pressure ; there are intestinal disturbances, vomiting and diarrhœa, and radiating pains in the direction of the shoulder, but these are seldom severe. Occasionally it is possible to make out a definitely local enlargement, with fluctuation. As the disease progresses, rigors, followed by profuse perspiration, become more frequent. If perforation occurs into the lung, the patient coughs up first a red blood-stained sputum, and then quantities of purulent matter containing hæmatoidin crystals or bile. There is usually no jaundice ; this is most commonly associated with abscesses originating in a septic cholangitis.

In chronic liver abscess, progressive weakness and loss of flesh are the chief symptoms which attract attention.

Diagnosis.—Very important is a careful enquiry into the history as to the existence of some one of the already-mentioned antecedents of liver abscess. The diagnosis will be based on the presence of the symptoms just enumerated. According to Koch, the attitude is characteristic : the patient bends to the right to relax the pressure on that side. Leucocytosis and peptonuria will point to the presence of pus. A skiagram will sometimes show an abnormal outline of the upper border of the liver shadow ; exploratory puncture will decide the question. An important rule is that a diagnosis of liver abscess is only justifiable when it is possible with certainty or great probability to diagnose the original source of suppuration (Leube).

Regarding the diagnosis of the site of the abscess, the following points are important :—If the diaphragm is pushed up to the third or fourth rib, and the liver enlargement is sharply defined on percussion, the abscess must lie immediately under the diaphragm. If the inferior border of the liver is exceptionally low, the abscess is not necessarily here ; only if the enlargement here is localized and circumscribe

is one justified in so deciding. When palpation of the liver reveals a constantly tender spot the abscess is probably close beneath the surface here. If the liver dullness alters with changes of position there are probably no peritoneal adhesions; fixity of the liver does not, however, absolutely indicate their presence; this can be diagnosed only from the existence of true local inflammatory œdema of the thoracic or abdominal wall.

Differential diagnosis from carcinoma may be particularly difficult, because a nodule of growth may soften and be associated with typical intermittent fever; the discovery of metastases would decide the question. Gastric cancer may be confused with an abscess of the left lobe, but will be distinguished by signs of obstruction to the passage of stomach contents and alteration in the stomach secretion (absence of hydrochloric acid). Exploratory puncture and radiographic examination will exclude pleurisy or pneumonia. Differentiation from pleurisy will be further facilitated if one remembers that in liver abscess the dullness will probably show a characteristic and circumscribed outline, and the line will descend as it approaches the vertebral column. Hydatid cyst develops more slowly than abscess, and runs an apyrexic course. Empyema of the gall-bladder is distinguished by its characteristic shape and position. In perinephritic abscess there is usually a history of antecedent renal disease, tenderness on pressure over the kidney, and œdema in the loin. Hydro- and pyonephrosis are characterized usually by variations in the size of the swelling, associated with intermittent polyuria. In malaria there is splenic enlargement, which is not present in liver abscess.

INDICATIONS FOR OPERATION.

If clinical signs point to abscess of the liver, operation, that is to say puncture or incision, should be done without delay. Exploratory puncture should be done only when the surgeon is prepared at once to open the abdomen if necessary. When the liver abscess is complicated by empyema, suitable surgical treatment must be undertaken for this condition also; that is to say, rib resection and drainage.

Signs of perforation into thorax or abdomen demand

immediate operation. Perforation into the peritoneal cavity is shown by sudden agonizing abdominal pain, collapse, and muscular rigidity, associated with rapid alteration in the configuration of the liver demonstrated by palpation, percussion, or radiography.

Contra-indications.—When the signs of abscess are distinct, the only contra-indications are such collapse as will necessarily render any operation fatal, and the presence of universal pyæmia with multiple septic foci. When the diagnosis is doubtful, the advisability of exploratory operation will be judged from the condition of the patient. Exploratory puncture must never be done below the costal border, and is never justified unless operation can follow at once.

Prognosis.—*Of operation.*—The earlier the operation the better the prognosis; this is shown in statistics. Some surgeons report only one fatality in seven, others record a mortality of 70 per cent and over. Perutz has collected 182 cases from the literature of the last ten years, with an operative mortality of 24 per cent. Out of 48 cases operated on abdominally 35 recovered; in 132 transpleural operations 101 recovered. Of 25 cases, in which at the time of the operation there was some complication (subphrenic abscess, empyema, rupture into the lungs), 8 recovered and 17 died. In most cases the recovery was complete. Koch reported 42 cases, 38 of which were cured by operation. The healing process is slow and runs to six weeks or more. The statistics of Jimenez show that puncture is a dangerous proceeding owing to the risk of infection of the peritoneum; of 297 cases punctured 82 per cent died. Puncture may cause death from hæmorrhage, or allow the abscess to empty itself slowly into the peritoneum and set up peritonitis.

If no operation is done, the abscess may become encapsuled and give rise to few symptoms for a long time; it often, however, progresses again in consequence of some trauma. In most cases the abscess steadily enlarges, and usually ruptures into a neighbouring organ; rupture into the air passages and bowel often ends in recovery. The mortality from liver abscess not operated on is the same for tropical and non-tropical cases, according to Langenbuch, that is to say, one recovery to four deaths. The average duration of life in cases not operated on is from 1 to 5 months.

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ATROPHIC CIRRHOSIS OF THE LIVER.

Etiology.—Alcoholism is by far the most common cause of atrophic cirrhosis; it is occasionally due to syphilis, malaria, and chronic intoxications.

Pathological Anatomy.—In this affection the liver shows primarily a diffuse hyperplasia, and, secondarily, shrinking and contraction of the interlobular connective tissue. A considerable amount of the liver parenchyma atrophies, and many of the branches of the portal venous system are obliterated. In the later stages the liver as a whole is shrunken and the surface corrugated, the portal

vein and its branches are distended, and the spleen is usually enlarged. Collateral venous channels are often enlarged and varicose, and particularly those at the lower extremity of the œsophagus.

Clinical Course.—The stage of enlargement is often undetected clinically; it is followed by the stage of shrinking, in the course of which the liver becomes firmer to the touch. The surface is uneven and the edge firm and easily palpable. When the condition has made considerable progress the spleen is found to be enlarged. Ascites often appears at a relatively early stage, but is occasionally late. It develops sometimes insidiously, sometimes suddenly; it is painless throughout, and is often extreme.

Hæmorrhages from the gastro-intestinal tract frequently occur, and often constitute one of the early symptoms. Varicose distension of the veins of the abdominal wall is often to be seen, and sometimes has the formation of the so-called "caput medusæ" around the umbilicus. Occasionally the exudation is hæmorrhagic, and when a pleural effusion is also present it may have the same characters. Tuberculosis of the lungs frequently complicates the condition; it is rare to find jaundice, but it is occasionally present in advanced cases.

Diagnosis.—The diagnosis will be based on the characteristic changes in the consistence and size of the liver, the presence of ascites and enlargement of the spleen, and the occurrence of hæmorrhages into the gastro-intestinal tract. When a mitral or tricuspid affection is present and the hepatic symptoms improve after the administration of cardiac remedies, the case is one of venous congestion of the liver. Chronic hyperplastic perihepatitis is often difficult to distinguish from cirrhosis; in its early stages there is often perihepatic friction, and this condition must always be thought of in cases where there is no alcoholic history, when there is an accompanying non-tubercular pleuritic and pericardial affection, and the ascites remains stationary for some years.

Obstruction at the hilum of the liver, for example by new growth, causes intense jaundice as well as ascites. Tubercular peritonitis does not run an apyrexic course throughout, and shows a marked tendency to the formation of localized collections.

INDICATIONS FOR OPERATION.

Surgical treatment may consist simply of puncture for the temporary relief of ascites, or an attempt may be made to give permanent relief by the opening up of new venous channels to supplement the obstructed portal circulation.

Tapping is indicated (*a*) when the pressure of the fluid threatens death from suffocation; (*b*) in the earlier stages when the respiration, circulation, and nutrition are embarrassed. Many writers advocate drawing off ascitic fluid at a still earlier period, but my own opinion coincides with that of the majority, who are in favour of postponing the tapping until one or other of the above-named symptoms has made its appearance. Tapping frequently repeated entails a not inconsiderable risk owing to the loss of albumin, and should therefore be avoided when possible; it is not necessary to repeat it until the patient again shows signs that his circulatory, respiratory, or digestive systems are suffering from the ascites.

The Talma-Morison operation, which consists of fixation of the omentum, liver, and spleen to the abdominal parietes for the purpose of opening up new venous channels, is indicated when medical treatment fails to influence the reaccumulation of fluid and tapping has to be repeated, whether the liver is small and shrunken or not. The diagnosis must be definite before the operation is advised; if postponed to the late stages, changes in the peritoneum may render it ineffective. I view also as an indication for this operation the occurrence of repeated profuse hæmorrhage into the stomach and intestine, even in cases where ascites is absent or slight, and there is no jaundice; these hæmorrhages point to pronounced engorgement of the portal circulation, and not infrequently cause death; I have seen several fatal cases.

Contra-indications.—Talma cites as contra-indications to his operation the presence of long-standing jaundice, urobilinuria, acholia or hypocholia of the fæces, and xanthoma. Serious cardiac or vascular lesions also contra-indicate it. Operation is also inadvisable in cases where the cirrhosis is of long standing and the general symptoms are of a serious type, as under these circumstances the function of the liver cells is largely destroyed and there is

considerable risk of auto-intoxication. Another contra-indication is the occurrence of repeated hæmorrhages from the mucous membranes, associated with jaundice.

Risks of operation.—Out of 164 cases of omentofixation collected by Zesas, 72 ended fatally. Purulent peritonitis figured relatively frequently as a cause of death among these. There is a possibility of auto-intoxication, owing to the exclusion of the liver function in removing toxic material from the blood. The intestine may be kinked if the omentum is made taut by suture (Franke). Usually the dangers of anæsthesia have been avoided by performing the operation under a local anæsthetic. The operation should not take long, but the patients are always in an enfeebled condition, and the statistics show that many of the deaths have occurred from shock. Puncture of the abdomen under aseptic precautions is practically free from risk; in one of my cases fatal hæmorrhage from dilated œsophageal veins followed tapping, but whether the tapping had anything to do with the accident is uncertain.

Prognosis.—*Results of operation.*—Of Zesas' 164 cases 51 were cured, but it must be stated that the after history was followed in only a small proportion of the cases for periods of from three months to two and three-quarter years. Twenty-six of the remainder were improved, and eleven showed no improvement. Of seven cases reported by Pal and Frank three were cured, in two the ascites returned, and two died, but not in consequence of the operation. Of great interest is a later communication by Pal, that in one patient in whose case the operation had been classed as a failure clinical signs of recovery commenced a year and a half later. The operation opens up new channels for the portal blood, and these remain permanently open.*

Without operation.—Most cases of cirrhosis of the liver end fatally after a variable period when, after the first tapping, the fluid reaccumulates in spite of a rigidly-restricted diet and diuretics. Death is in many cases

* Of 255 cases collected by Bunge, 66 were cured, 27 improved; in 35 there was no improvement, and in the remainder death was recorded, not necessarily connected with the operation [Trans.].

due to repeated hæmorrhages from the gastro-intestinal tract. In a small number of cases spontaneous arrest has occurred and even clinical recovery, when the habits causing the affection were surrendered.

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MOVABLE LIVER.

Etiology.—Hepatoptosis may be due to congenital anomalies, to the pressure of tight corsets, to injury, to rapid loss of flesh, or to multiple pregnancies.

Pathological Anatomy.—The liver is displaced from the right hypochondrium downwards, and is no longer in contact with the under surface of the diaphragm. The organ may descend horizontally and rotate on its frontal axis, or the right lobe may be chiefly affected and reach the iliac crest. It is often fixed by adhesions in its new position, and may be much altered in shape. There is often an accompanying ptosis of other organs, for example, the spleen and the kidneys.

Clinical Course.—In cases where the dislocation takes place suddenly there are acute symptoms, abdominal pain, and collapse. The subacute and chronic cases present a great variety of symptoms. There are often vague pains, which come on in attacks, particularly when the patient

sneezes, coughs, or raises the arms; jaundice is sometimes present, due to kinking of the bile-ducts; palpitation is common. The displacement of the liver is revealed by palpation and percussion; it is not tender to pressure. When the patient stands the epigastrium usually shows depression.

DIAGNOSIS.—The physical signs render the diagnosis easy, particularly when the liver can be replaced upwards into its normal position. It is distinguished from a movable kidney by the presence of intestine in front of the latter; a renal swelling is shown to be distinct from the liver by percussion and palpation, and the physical signs also differentiate it from tumours of the liver, of the intestine, or of the peritoneum.

INDICATIONS FOR OPERATION.

If the liver is considerably displaced, and the displacement gives rise to persistent and marked symptoms which cannot be relieved by bandage or other appliance, if also the patient is unable to follow his occupation and is depressed by his condition, then operation is justifiable. The operation consists in fixing the liver in its proper position after freshening its upper surface in order to obtain adhesions over as wide an area as possible.

Contra-indications.—If the symptoms are slight and principally hysterical, operation is not advisable; under such circumstances it is quite possible that operation will neither cure nor relieve. There is little prospect of success when hepatoptosis is merely part of a general enteroptosis. Operation is contra-indicated in advanced age.

PROGNOSIS.—*Results and risks of operation.*—The immediate risks of operation under strict asepsis are slight, but damage may be done to the bowel or some other organ in the course of separating adhesions. The majority of patients operated on are relieved of their symptoms, and are enabled to resume work.

Without operation.—There are no serious risks attached to this condition, but so long as it is unrelieved the patient will probably complain of persistent and severe pain and sensations of dragging, and will be permanently unable to work.

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THE CONSTRICTED LIVER.

Etiology.—The long-continued compression of the thorax by tight corsets produces a characteristic series of anatomical changes and symptoms.

Pathological Anatomy.—There are various types of the deformity which may be produced by tight lacing. In the only type which presents any surgical interest, a portion of the right lobe is more or less separated off from the rest of the liver in advanced cases the hepatic tissue is completely destroyed at the point of greatest pressure, and the thickened and bulky mass of separated liver is attached to the rest of the organ only by connective tissue, vessels, and bile-ducts.

Clinical Course.—In most cases compression by the corset gives rise to no symptoms. Sometimes the separated lobe, when swollen and œdematous, causes a sense of weight and pressure which gives rise to a considerable amount of distress. The pain may radiate to the thorax and the shoulder. There may be vomiting and tenderness on pressure over the mass. Sometimes the artificially-formed lobe is very mobile; movable kidney is a frequent complication. The line of intersection has a horizontal direction, and the vertical measurement of the liver is increased, especially towards the right.

Diagnosis.—In cases which are not very advanced it is easy to make out on palpation that the strangulated

mass belongs to the liver, and in such cases it moves with respiration. At a later stage it becomes more movable and more displaced, and does not move in respiration. As a rule it is easily distinguished from a movable kidney, as the latter occupies chiefly the lumbar region, while the liver mass is easily felt on palpation of the abdomen from the front. It is often useful to place the patient half over on the left side, when the liver lobe sinks to the left and the movable kidney is more easily palpable. The ascending and transverse colon lie behind the mass. Careful examination will be necessary to distinguish this condition from new growths of the intestine and of the gall-bladder and from perityphlitis, etc. However enlarged and swollen the lobe may become, it remains mobile; jaundice is practically never present.

INDICATIONS FOR OPERATION.

Operation is only justified in advanced types of the condition, where the anatomical changes are extreme and a freely-movable lobe is present which has caused pronounced symptoms for some considerable time, making the patient unable to work and low-spirited. Other treatment should always be tried before operation is advised. Notwithstanding the frequency of this deformity operation is rarely indicated, if one may judge from the small number of cases recorded. The symptoms are rarely so extreme as to make it necessary. I have myself seen many marked cases, but have never judged it necessary to advise operation. The procedure employed is either fixation of the lobe to the abdominal parietes or resection.

Contra-indications.—When the separated lobe is swollen and painful, and this state of affairs has been present only a short time, expectant treatment should always be tried first, and under its influence the pain and swelling will usually disappear. When there is reason to believe that most of the symptoms are hysterical and nervous rather than due to strangulation of the lobe, no operation should be done.

Prognosis.—*Risks of operation.*—Neither ventrofixation nor resection is free from risk; serious hæmorrhage may complicate the latter.

Results of operation.—In most cases which have been

operated on the results have been quite satisfactory. Ventrofixation of the lobe appears to be a satisfactory method of permanently anchoring it.

Prognosis without operation.—If a suitable bandage or apparatus be fitted, the gastro-intestinal functions regulated, and the general defects of the circulation energetically combated, the symptoms produced by this condition become supportable after a short time as a general rule. It is only rarely that any serious symptoms (e.g., peritonitis) are produced.

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CHAPTER XX.

Diseases of the Spleen.

Chapter XX.

DISEASES OF THE SPLEEN.

TUMOURS AND CHRONIC HYPERPLASIA OF THE SPLEEN.

Etiology.—Chronic hyperplasia of the spleen may be due to some "blood disease" (leucæmia, pseudoleucæmia), or to one of the infections and intoxications (syphilis, malaria, alcohol), or may arise without recognizable cause, and is then styled idiopathic. Enlargement of the spleen also occurs in some affections of the circulatory system: cardiac dilatation, pericardial adhesions, and hepatic cirrhosis. The etiology of splenic tumours is that of tumours in general; cystic growths often follow injury, or may be of hydatid nature.

Pathological Anatomy.—Hydatid cysts are sometimes of enormous size; they are usually unilocular, rarely multilocular, and not uncommonly suppurate. The non-parasitic cysts are usually single; their contents may be serous, serohæmorrhagic, or hæmorrhagic; they may be of large size, and may reach a weight of 10 kilograms. Both types of cystic growth may become much adherent to surrounding parts, but this is not the rule; cysts are proportionately common in "floating" spleen. The solid growths are rare; sarcomata, angiomata, and other forms have been described; tubercle and syphilis may give rise to masses of granulation tissue formation. Metastatic growths also occur. "Idiopathic" chronic hyperplasia occurs in association with a secondary cirrhosis of the liver, the so-called Banti's disease. Hyperplasia may be secondary and may be due to hepatic cirrhosis, portal obstruction, amyloid degeneration, syphilis, tuberculosis, and chlorosis. In all forms of tumour and hyperplasia the adhesions may be extensive.

Clinical Course.—Tumours of the spleen may manifest themselves, according to the nature of the fundamental cause, by local symptoms alone (pain, tenderness on pressure, fullness, gastric and intestinal disturbances), or by general constitutional signs. The parasitic and the non-parasitic cysts occur with special frequency in women of middle age ; they may be situated in the body of the spleen, or at its lower pole. The presence of these cysts does not, as a rule, affect the general health ; there is often a history of preceding trauma. A fluctuating tumour is found, but the hydatid thrill is rarely to be made out. Inflammatory affections of the pleura and lungs often occur as complications.

When a solid growth is present the surface of the organ is uneven, and sometimes nodules are to be felt. Malignant growths develop rapidly and affect the general health.

Hyperplasia may reach large dimensions in chronic malaria, and remain stationary in spite of energetic treatment with quinine and arsenic preparations ; in this and in the hyperplasia of leucæmia and pseudoleucæmia there is a tendency to the occurrence of hæmorrhages.

Primary chronic hyperplasia affects particularly women between the ages of 30 and 40, and often persists for several years ; its etiology is obscure. The enlargement of the organ is the solitary morbid phenomenon, and is the sole cause of the existing symptoms.

In all forms of hyperplasia the enlargement is usually uniform, downwards, and to the right. The organ moves freely with respiration, is deeply notched, and, as a rule, there is no intestine in front of it. If the peritoneal surface becomes inflamed, friction is often to be heard. When the enlargement is great the lower thoracic outlet is widened, the diaphragm is pushed upwards, and the heart and lung are displaced. The upper pole of a splenic enlargement can often be well seen on a radiograph.

Diagnosis.—The diagnosis of a splenic tumour rests on its position, its remarkable mobility on respiration, the notches of the lower border, the relations with the intestine, its mobility in an upward direction towards the left side of the epigastrium, and its position underneath the costal arches. The characters of true new growths, cystic and solid, have already been referred to. Examination of the

blood will reveal the true nature of the hyperplasia which occurs in leucæmia, pseudoleucæmia, and malaria, and changes will also be present in the lymph glands, the liver, and other organs. Secondary hyperplasia will be diagnosed when the morbid states which have been mentioned as causing this condition are found. Idiopathic hyperplasia will be diagnosed by a process of exclusion, when none of the recognized causes can be discovered. Banti's disease is associated with anæmia in the first stages, and later with ascites and secondary cirrhosis of the liver.

INDICATIONS FOR OPERATION.

When a cystic growth of the spleen is definitely diagnosed, operation is indicated. The necessity for operation is the more urgent the more acute the local symptoms and the greater the rate of growth. Operation is urgent when fever is associated with the presence of a cyst, pointing to the supervention of suppuration. If the tumour is stationary, if the local symptoms are slight, and if there is no fever, there is no immediate call for surgical treatment.

When a splenic enlargement appears to be due to true primary new growth, and is rapidly increasing, splenectomy is indicated. In the case of malarial hyperplasia, if the pain, sense of weight, and other local symptoms are distressing, if the enlarged organ is very mobile, suggesting the possibility of torsion of the pedicle, or if other dangerous symptoms are induced, removal is advisable if medical treatment fails. The indications are the same in cases of idiopathic splenomegaly. When the general health is good the presence of hyperplasia alone, in the absence of the complications just mentioned, cannot be considered a strict indication for removal in view of the risks of operation.

Contra-indications.—In cases of cystic tumour or of multiple hydatids, splenectomy is not to be advised when there are serious complications in other organs, or waxy disease.

Exploratory puncture is dangerous; peritonitis may be set up, which may be fatal if the cyst contents are purulent, or hydatids may be in this way distributed throughout the peritoneal cavity.

Leucæmia is an absolute contra-indication to splenectomy; in all the reported cases death has resulted; Jordan has

collected 28, all with the same result. Pseudoleucæmic hypertrophy is equally unsuitable for operation; the dangers are considerable, and the results are *nil*. In malarial cases, severe cachexia, marked anæmia, general œdema, a tendency to hæmorrhages, and the probability of extensive adhesions, all contra-indicate operation. The idea of operation will not be entertained in cases where the splenic enlargement is secondary to hepatic cirrhosis, or to venous congestion from heart disease or portal obstruction, in waxy disease, tuberculosis, or syphilis, or where a splenic tumour is of metastatic origin.

Prognosis.—*Of operation.*—In cases of cystic disease the prognosis is favourable. All the cases of blood cyst hitherto operated on, 12 in number according to Jordan, have recovered, the cases being treated either by splenectomy, resection, incision, or enucleation. In hydatid disease, in spite of the existence of extensive adhesions in several cases, 15 out of 17 recovered (Jordan). In one case which I saw some years ago the sac was punctured and iodine injected with good result, but this proceeding must be considered risky.

The five cases of primary splenic sarcoma which have been operated on up to the present, all recovered, one permanently. Extirpation is therefore indicated in primary malignant disease, although in some cases recurrence has been rapid.

Extirpation of the enlarged malarial spleen is very dangerous. In 117 cases there was a mortality of 27 per cent (Fevrier). If the organ is mobile the risk is much lessened; in 26 such cases there was but one death (Bessel-Hagen). It is necessary, therefore, to be very careful in recommending operation; the local symptoms are quickly relieved thereby, but the general symptoms improve only slowly.

The cases of idiopathic hyperplasia show an operative mortality of 13 per cent, two deaths in fifteen cases.

There is no physiological objection to removal of the spleen. Experience has shown that the individual can get on quite well without the organ, and that its functions are quickly replaced.

Without operation.—Primary new growths and hydatid cysts, unless operated on, are eventually fatal. Blood

cysts may be dangerous in a high degree if some complication supervenes, such as suppuration, torsion, or bursting.

The large malarial spleen may be a continual source of suffering, may be the cause of some fatal complication, and may compromise the general health by interfering with digestion. Chronic primary hyperplasia is only dangerous when the spleen is very mobile, or of very large size.

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BANTI'S DISEASE.

ETIOLOGY.—The etiology of this affection is unknown; it develops relatively often in young individuals.

PATHOLOGICAL ANATOMY.—The knowledge of the pathological anatomy of this condition is scanty. The spleen is enlarged, and this enlargement is chiefly due to an overgrowth of connective tissue. The liver exhibits the condition of atrophic cirrhosis, and is sometimes divided up by dense cicatricial septa. Marked atheromatous changes have been described in the portal and splenic veins.

Clinical Course.—Banti has described three stages of the disease. The first stage is that of gradual splenic enlargement, associated with anæmia. The spleen becomes very large and firm, with a smooth surface. The symptoms of anæmia become steadily more and more intense: palpitations, lassitude, œdema of the feet, epistaxis, etc., but they do not necessarily advance in proportion with the splenic enlargement. There is a fall in the number of both red and white cells, and in the proportionate amount of hæmoglobin. There is no fever, no enlargement of lymphatic glands, no ascites, and no abnormal constituent in the urine. This stage lasts usually about three to five years, but may be prolonged to ten years. The second stage is characterized by diminution in the quantity of the urine, the appearance of bile pigment in the urine, jaundice, and gastro-intestinal disturbance. It lasts for several months. The third stage is that of secondary cirrhosis of the liver, with ascites. The ascites sometimes disappears temporarily. There are evening rises of temperature; the anæmia, jaundice, and tendency to hæmorrhages become more and more marked. Death occurs usually at the latest about a year after the onset of the third stage. Several times cholelithiasis has been found co-existent.

Diagnosis.—All the other recognized causes of splenic enlargement—malaria, pseudoleucæmia, etc.—are absent, and the course of the disease is sufficiently characteristic to make the diagnosis clear.

INDICATIONS FOR OPERATION.

In several cases arrest of the disease and even cure has been obtained by splenectomy. This operation is indicated when the size of the spleen is such that it is giving rise to serious local symptoms, and when the accompanying liver cirrhosis threatens danger to life (Jordan). Operation may be necessary on account of the enlargement of the spleen alone when it is mobile and torsion of the pedicle threatens. Inability to work and the necessity of earning a living will influence the surgeon towards undertaking operation. Early operation should not be advised in the absence of the indications mentioned, as the course of the disease is uncertain and operation must always be a serious risk.

Contra-indications.—Operation will be inadvisable when the general condition is very bad. It should not be recommended when the general condition is still good, anæmia absent, local symptoms slight, and the signs of hepatic disease insignificant. Extensive adhesions are a contra-indication; their presence will be diagnosed when the organ does not move with changes of position and respiration, when during the course of the disease friction has been heard over it, and when it cannot be displaced by the palpating band.

Prognosis.—*Of operation.*—In 16 cases collected by Bessel-Hagen, 13 were cured by the operation; the remaining three died. The operation is, therefore, always attended by risk, whether adhesions are present or not. Tansini has performed splenectomy during the third stage; five months later the patient had all the appearance of perfect health. In cases which progress favourably the general condition shows no permanent damage. If no operation is done the affection inevitably terminates fatally in the third stage.

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FLOATING SPLEEN.

Etiology. — The most important etiological factors are congenital anomalies, such as abnormal length of the ligaments, and acquired lengthening of the ligaments by trauma or by the increased weight of the enlarged organ. Such enlargement is most commonly due to malaria, leucæmia,

or pseudoleucæmia. The non-hypertrophic floating spleen is most common in women.

Pathological Anatomy.—The dislocated spleen has been found in all the regions of the abdomen. Most commonly it is in the left hypogastrium; in many cases the position of the hilum is much modified. Such a dislocated organ is often hypertrophied, and sometimes profoundly altered in structure, by torsion of its pedicle; it may be atrophied and shrunken, or sometimes gangrenous; in the latter case the afferent and efferent vessels are obstructed or entirely obliterated. The pedicle may have more than one complete turn. A dislocated spleen may be fixed by adhesions in its abnormal position.

Clinical Signs.—A movable abdominal tumour is found, and the spleen is absent from its normal position. Unless it is fixed by adhesions it can be replaced in its normal situation. There may be no symptoms; but often the patient complains of vague troubles, feelings of distension, nausea, dyspepsia, headache; sometimes there are neuralgic pains, and even paralyses of the legs or bladder tenesmus. Cases presenting symptoms of intestinal obstruction have often been described. Frequently there is general enteroptosis.

Diagnosis.—If the movable tumour has the characteristic shape of the spleen, with the notch of the internal border, and the hilum containing pulsating vessels; if percussion is tympanitic over the normal splenic area and changes when the tumour is replaced, there can be no doubt as to the diagnosis. The condition is often mistaken for floating kidney and movable ovarian tumours, and sometimes for tumours of other abdominal organs. The outline of the tumour is important, and the examination of the loin for the kidney, and of the pelvis for connections with the generative organs. Friction over the tumour indicates perisplenitis. Torsion of the pedicle must be diagnosed if the patient has a sudden attack of acute pain, associated with enlargement and exquisite tenderness of the splenic tumour, if the latter is noted to have altered its position, and symptoms of early peritonitis and of collapse supervene.

INDICATIONS FOR OPERATION.

If, in spite of internal treatment prescribed with a view to lessening the size of the spleen, and in spite of the wearing

of suitable bandages, the pains persist to such an intense degree that life is made miserable, or if the spleen is of such a size that in itself it constitutes a danger to life, then operation is advisable.

If torsion of the pedicle appears probable, extirpation should be performed with a view to avoiding this very dangerous complication. Some surgeons consider that a movable spleen, whether enlarged or not, should be extirpated in view of the possibility of torsion of the pedicle. This radical advice has not, however, at present many supporters; statistics show that the operation is not free from risk, and, on the other hand, torsion is very unusual when the organ is of normal size. Fixation of the spleen by suture has been often recommended for such cases on account of the smaller risk, but even this operation should not be recommended for simple mobility unless the condition is giving rise to marked symptoms.

Contra-indications.—If the patient's general health is very bad, or if there are lesions in other organs, operation will not be advisable; leucæmia or pseudoleucæmia are absolute contra-indications. Even when the pains and other local disturbances are intense, operation should not be done if they are present only for short periods and if the spleen is of normal size, unless torsion of the pedicle is suspected. Such symptoms may disappear entirely for a long time after reposition of the organ. Seven years ago I had under my care a young girl with floating spleen who had attacks of intense pain of short duration; these disappeared after the application of a bandage. Although she has been without the bandage now for some five years, she has had no further attacks.

When the tumour is of very large size the danger of operation is great, and in such cases extirpation is only exceptionally indicated. Pregnancy does not absolutely contra-indicate extirpation.

Prognosis.—*Risks of operation.*—Up to 1900, 92 cases of floating spleen (of different etiology, hypertrophied, and also of normal size) had been treated by extirpation (Bessel-Hagen). Of these 17 died from the operation. The operative mortality is very high in cases of torsion of the pedicle, on account of the serious nature of the condition. The prognosis is relatively good in cases of malarial enlargement

without torsion (1 fatality in 15 cases), and in simple hypertrophy (2 deaths in 28 cases).

Results of operation.—Almost all cases regain their capacity for work in a short time, and completely lose their pains.

Without operation.—In many cases mobility of the spleen is well tolerated without symptoms or with only slight disturbances. If torsion of the pedicle occurs, necrosis follows and death results unless operation is done.

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RUPTURE OF THE SPLEEN.

Etiology.—The spleen is ruptured by injury, and the accident may happen to the normal or the enlarged organ. When altered by disease, slight injury may be sufficient to cause rupture, and this is especially true of the malarial spleen.

Pathological Anatomy.—Rupture of the spleen may be the sole result of an abdominal trauma. Extravasation of blood takes place into the abdominal cavity in large quantity, and collects in its most dependent parts, or may be limited by adhesions. In one of my cases an extravasa-

tion limited by adhesions around the spleen simulated an enormous fixed splenic tumour.

Clinical Course and Diagnosis.—The symptoms of rupture of the spleen are those of serious internal hæmorrhage. First excruciating pain, pallor, vertigo, vomiting, and syncope; then the pulse becomes small and rapid, the abdomen becomes distended, and there are signs of fluid, either free in the peritoneal cavity or confined to the splenic area. If the size of the hypertrophied spleen is already known before the accident, its diminution is an important aid in diagnosis. The diagnosis is, as a matter of fact, only exceptionally possible, because internal hæmorrhage from other abdominal organs produces the same symptoms, but it is probable when the fluid signs extend from the left iliac fossa towards the right, and the previously enlarged spleen diminishes in size.

INDICATIONS FOR OPERATION.

When the signs and symptoms point to internal hæmorrhage from splenic rupture, the abdomen must be opened at once to discover the source of the hæmorrhage and remove the spleen.

Prognosis.—*Risks and prospects of the operation.*—According to Jordan, in 29 cases operated on between 1893 and 1903, life has been saved by splenectomy. Considering the gravity of the affection the operation must, of course, be considered a serious undertaking. The prognosis by "expectant" treatment is exceedingly bad; the great majority of cases so treated die.

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ABSCESS OF THE SPLEEN.

Etiology.—Splenic abscess is usually due to injury, to suppuration in the neighbourhood of the spleen, or to embolus in ulcerative endocarditis. It occurs exceptionally in cases of recurrent fever and enteric.

Pathological Anatomy.—Splenic abscesses may be central or peripheral, solitary or multiple. The size varies enormously up to that of a child's head. Sometimes the suppuration spreads beyond the spleen, and a subphrenic abscess is formed, and in such a case the spleen may be suspended in the middle of the abscess cavity. Dense adhesions may be formed to surrounding structures. The pus may be sterile.

Clinical Signs and Diagnosis.—The diagnosis of this rare affection is only occasionally possible. In a case of ulcerative endocarditis or enteric fever, if the patient complains of severe pain in the splenic region radiating to the left shoulder, if there are perisplenic friction, rigors, and fever which becomes remittent after a time, the diagnosis will be clear. If a fluctuating area is discovered in an enlarged spleen, exploratory puncture will clear up the diagnosis, and if pus is found laparotomy must be done forthwith. Sometimes the pus makes its way into a neighbouring hollow viscus, sometimes into the abdominal cavity or the lung, and the size of the enlarged organ will then markedly diminish. Among several cases which have been under my care, the diagnosis was made in one only by exploratory puncture. Most frequently I have seen it in cases of endocarditis, and once in a case of pylephlebitis secondary to disease of the appendix.

INDICATIONS FOR OPERATION.

If the diagnosis is certain operation is absolutely indicated. The operation will consist either of puncture, which is dangerous, on account of the risk of infecting the peritoneum, or incision, or extirpation when the spleen is bathed in pus and free from adhesions.

The only contra-indications are the presence of multiple suppurative foci in the kidneys and elsewhere, and such a state of general weakness that the patient will stand no operation whatever.

Prognosis.—Splenic abscess is usually fatal. It may become encapsuled, and after long latency recrudescence may take place. The case to which I have alluded was that of a woman who had had puerperal fever some years previously; when seen she complained of severe pain in the region of the spleen, but had no fever.

Laspeyres has collected 11 cases which were submitted to operation; recovery took place in all. It is probable that there have been fatal cases which have not been published.

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CHAPTER XXI.

Diseases of the Pancreas.

Chapter XXI.

DISEASES OF THE PANCREAS.

INFLAMMATION AND NECROSIS.

Etiology.—Pancreatitis may be secondary to ulcerative processes in the stomach and duodenum, or may be due to injury, spontaneous hæmorrhage, cholelithiasis, or pancreatic calculus. Fat people are predisposed to pancreatic necrosis.

Pathological Anatomy.—Suppurative, acute, hæmorrhagic, and necrotic pancreatitis have been distinguished pathologically; these are not distinct types, but pass into one another. Frequently small foci of fat necrosis are found distributed throughout the peritoneal cavity. As a result of inflammation and necrosis, large purulent and septic collections may form, surrounding the necrosed gland, and often encapsuled by extensive peritoneal adhesions; these abscesses usually occupy the upper part of the abdomen. Many cases are complicated by infective cholangitis of long standing, not uncommonly with impaction of a calculus in the ampulla of Vater, and regurgitation of infected bile from the common bile-duct into the pancreatic duct.

Clinical Course.—Mayo Robson has distinguished three clinical types of pancreatitis: the acute, the subacute, and the chronic. In corpulent individuals the disease often has an acute and sudden onset. It commences with severe pain in the epigastric region, vomiting, nausea, and peritoneal symptoms. Meteorism rapidly develops, and diffuse tenderness of the abdomen, with obstruction of fæces and flatus. The pulse is small and rapid, and the patient usually much collapsed; fever is often absent.

If the patient does not die early from shock, an

inflammatory swelling develops gradually in the upper part of the abdomen, accompanied by pronounced loss of strength and remittent fever. If the stomach and colon are distended with air, the physical signs will show that the swelling lies behind both. Enemata will often empty the bowel, and later even diarrhœa may appear. Sometimes the stools are fatty, and may contain undigested muscle fibres ; in several cases glycosuria has been present. There is persistent nausea and vomiting.

The skin is sometimes of a greyish brown colour. Jaundice is often present, particularly when the pancreatitis is of the chronic type, and in this form the enlarged head of the pancreas may be felt as a hard tumour. The rapid wasting causes a suspicion of new growth, and the attacks may resemble gall-stone colic in such a way that this condition may be diagnosed. As has already been stated, the disease is often secondary to impaction of a stone in Vater's ampulla. The gall-bladder is frequently distended and palpable.

Diagnosis.—The diagnosis is often very difficult, and in the early stages of acute pancreatitis it cannot as a rule be made with certainty. In most cases the condition has been diagnosed as intestinal obstruction or perforative peritonitis. Later the difficulties are less when there is a history of a sudden onset, with pain in the epigastrium, vomiting, constipation, and distension, when the temperature is raised and a swelling is present in the characteristic position. If the stomach and colon be distended and are found to lie in front of the tumour, the latter cannot belong to liver, gall-bladder, or spleen. Confusion must sometimes occur with obstruction, perforative peritonitis, perinephritis, or a burrowing abscess, but this will not often happen if the points mentioned are carefully considered.

In the case of a corpulent woman of middle age who had been under the care of Ewald and myself for some years, severe peritoneal symptoms suddenly appeared, and were followed by the development of a large inflammatory and apparently retroperitoneal swelling in the left hypochondrium. Seeing that the swelling extended across the middle line and was confined to the upper part of the abdomen, it was thought that we had to do with an inflammatory affection of the pancreas (? necrosis). The

abscess was opened, and throughout the peritoneum spots of fat necrosis were found. Recovery took place.

Chronic pancreatitis is specially frequently mistaken for carcinoma ; the head of the organ may be transformed into a large hard nodular mass, which, even on operation, cannot be distinguished from cancer.

INDICATIONS FOR OPERATION.

When a diagnosis of subacute pancreatitis is made, and even when the signs and symptoms point only to the probability of the condition, operation should be undertaken unless the general condition is extremely bad, particularly if there is a palpable inflammatory swelling in the upper abdomen. The abscess will be opened through an abdominal wound, and drained. When chronic pancreatitis is suspected, and serious symptoms, such as intense jaundice, rapid wasting, and severe pain, are present, operation is advised by many. Laparotomy is performed, and if a calculus is found it is removed and the pancreatic duct drained, or a biliary fistula is established, or cholecystenterostomy into the duodenum.

In acute pancreatitis many surgeons are in favour of operation, either simple opening of the abdomen and drainage, or exposure and incision of the pancreas ; others are opposed to this practice. The decision as to operation depends almost always on the surgeon, not on the practitioner or physician, for most cases are operated on under an erroneous diagnosis or as exploratory laparotomies.

Contra-indications.—In the first stage, when this is recognized, operation is considered inadvisable by many surgeons, for most of the patients have died of shock either during or soon after the operation. Whilst symptoms of severe peritoneal irritation (universal meteorism, frequent vomiting, obstruction to fæces and flatus) are present, and the patient is much collapsed, many surgeons think it well to suspend operation, but others, Mikulicz for example, advise operation even under these conditions.

Prognosis.—*Results of operation.*—In seventy-five cases of acute pancreatitis operated on early and late, twenty-nine recovered; of the latter twenty-five belonged to a group of thirty-seven cases, in which the pancreas itself was dealt with, whilst four only recovered out of forty-one cases

in which the pancreas was left untouched (v. Mikulicz). A considerable number of deaths have occurred immediately after the operation; others have taken place at variable periods from profuse suppuration or secondary hæmorrhages. Sometimes a pancreatic fistula forms, but this almost always heals. According to Mikulicz the prognosis of operation in chronic pancreatitis is good; of thirty-eight cases thirty-three recovered and five died. Truhart has collected seventeen cases of recovery after operation in cases with multiple abdominal fat necrosis.

Without operation.—In subacute pancreatitis or necrosis death usually occurs with progressive marasmus. Either universal peritonitis develops, or venous thrombosis, or abscess of liver or spleen, or a subphrenic abscess may form and involve the pleura and lung by penetrating the diaphragm. In rare instances spontaneous recovery has taken place in cases with multiple fat necrosis after elimination of the necrotic pancreas per rectum, or the spontaneous rupture of an abscess through the abdominal wall. Truhart has collected eight such cases.

Chronic pancreatitis in many cases causes death from cachexia and cholæmia by compression of the bile-ducts. I can call to mind a not inconsiderable number of such cases which I have had the opportunity of examining post mortem.

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PANCREATIC CALCULUS.

Etiology.—Nothing is known as to the nature of the processes which give rise to the formation of pancreatic calculi, except that anything which causes stagnation of secretion appears to conduce to their formation. They occur most frequently in men, between the ages of thirty-five and forty-five.

Pathological Anatomy.—As a rule more than one stone is found, and in some cases the canal of Wursung is encrusted. The place of lodgement is frequently in the neighbourhood of the duodenal opening; a calculus may reach the size of a cherry, the usual composition is calcium phosphate or carbonate. Frequently there are inflammatory changes in the pancreatic parenchyma and ducts, and abscesses may result therefrom.

Clinical Course.—The commonest symptom is the occurrence of severe attacks of colic, resembling biliary colic and localized in the epigastrium. Often the pain radiates markedly to the left. Greyish-white calculi of the characteristic composition are sometimes passed after an attack. Intense ptyalism has often been noted during an attack; late symptoms sometimes found are diarrhœa, with the discharge of quantities of unchanged muscle fibre and abnormal amounts of unabsorbed fat, and diabetes. There is sometimes jaundice during or after an attack; fever is unusual.

The diagnosis is based on the occurrence of attacks of colic, followed by the evacuation of characteristic concretions and sometimes by slight jaundice. Later symptoms which may appear are glycosuria, steatorrhœa, and disturbances of digestion. At these late stages the diagnosis is only possible in rare cases.

INDICATIONS FOR OPERATION.

According to v. Mikulicz, pancreatic calculi rarely give rise to characteristic symptoms unless they are discharged in the fæces, and it is only the secondary changes produced

by them which, as a rule, come to the notice of the surgeon. These changes are the result of obstruction of the pancreatic duct and its branches, and eventuate in a chronic or subacute pancreatitis. Surgical intervention finds an indication only in the symptoms produced by this condition of pancreatitis, but in all cases of this nature the possibility of the presence of a calculus should be borne in mind. The indications for operation will therefore depend upon the appearance of a palpable inflammatory swelling in the position of the pancreas, accompanied by pain, fever, and other pronounced symptoms.

Contra-indications.—The existence of colic without discharge of characteristic calculi, and without the appearance of a swelling in the position of the pancreas, leaves the diagnosis so uncertain that operation should not be recommended. If calculi are discharged and the symptoms are relatively slight, operation will again be inadvisable.

Prognosis.—With regard to the risks of operation and the prognosis as to recurrence if a stone is successfully removed, clinical experience is not sufficiently extensive for the formulating of a definite statement. Of three cases operated on two died from the operation, the third being cured by removal of a calculus through the duodenum.

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PANCREATIC CYSTS.

Etiology.—Injury and chronic interstitial inflammatory affections appear to be of considerable etiological importance. Individuals of middle age are most frequently affected.

Pathological Anatomy.—These cysts may be of great size and contain up to 20 litres of fluid. They grow forwards, as a rule, in the bursa omentalis, between the stomach and the transverse colon; more rarely they present above the lesser curvature or below the transverse colon. They are usually sessile, exceptionally pedunculated. They contain a colourless or dark-coloured fluid, in which the pancreatic ferments are usually demonstrable.

Clinical Signs.—Symptoms which are often present early are epigastric pain, vomiting, rapid wasting, and jaundice. The rounded, elastic, and generally immobile cyst is more usually in the middle line than laterally in the hypochondrium. Glycosuria or fatty stools are rarely found, and the intestinal digestion is as a rule unaffected. The growth is usually very gradual; periodic enlargement and dwindling have often been noted.

Diagnosis.—The diagnosis will be based on a history of trauma or chronic inflammation, on the presence of symptoms due to pressure on the stomach and intestine, and on the localization of the tumour and its relation to these organs. When the stomach is distended the cyst is in many cases partially covered, in most cases from above downwards, more rarely from below upwards. Distension of the colon will show that the cyst lies above it when it occupies the usual position between this and the stomach. Exploratory puncture is dangerous and not to be recommended.

Differential diagnosis from other cystic abdominal affections is often very difficult. In even a very large ovarian cyst the stomach is not found overlying, and when an ovarian cyst is situated high the uterus is dragged up. Cysts of the liver are never covered by the distended or inflated stomach. The enlarged gall-bladder hardly ever has intestine in front of it; cysts of the head of the pancreas are almost always overlaid in part; however, in one case of pancreatic cyst, verified by operation, I diagnosed a gall-bladder affection on account of the extreme mobility of the cyst and the history of the case. Splenic cysts are also to be differentiated by the absence of stomach or intestine in front of them. A hydronephrotic cyst does not develop forwards from the epigastrium, and when the colon is blown up it is easily palpable in the loin, this bowel being then often found medianwards of the swelling. Cysts

of the mesentery and retention cysts of the cavity of the omentum are often indistinguishable from pancreatic cysts extending forwards.

INDICATIONS FOR OPERATION.

Seeing that pancreatic cysts left to themselves become progressively larger, operation is advisable as soon as there is a reasonable certainty of the condition. Operation will be hastened by the presence of marked symptoms, particularly pain. Sudden collapse, associated with disappearance of the cyst and signs of peritoneal shock, point to rupture, and constitute an absolute indication for immediate operation. Operative intervention will consist in either opening the cyst after suture to the abdominal wall in either one or two stages, or in extirpation of the cyst. Puncture, either for diagnostic or therapeutic purposes, is a very dangerous proceeding; five out of seven cases so treated died.

Contra-indications.—There cannot be said to be any contra-indications except the presence of such general weakness, or intercurrent disease, or advanced age, as to render any operation inadvisable.

PROGNOSIS.—*Risks and results of operation.*—Of 141 cases treated by suture and drainage seven died as a result of the operation, one from a late infection from the fistula. Peritonitis resulting from escape of the fluid into the general cavity is especially to be feared. In 22 cases of extirpation there was a mortality of four; this method is more serious and more risky. A fistula may persist for a long time after operation, even for several years; a troublesome eczema often develops around the fistulous opening; in one case death occurred from erosion of the splenic artery. Necrosis of the cyst wall, often seen after incision, may give rise to septic infection.

Complete recovery is frequent after both drainage and extirpation. Ten cases reported by v. Mikulicz recovered entirely; in two the cyst was extirpated; in eight it was incised. In most cases recovery is permanent; in a few cases of incision recurrence has occurred. As a rule the symptoms disappear after operation.

Without operation.—In many cases death has occurred from rupture of the cyst or severe hæmorrhage into it.

The tendency is for the cyst to grow steadily, and produce all the painful and serious symptoms associated with large growths of the upper abdomen.

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SOLID TUMOURS OF THE PANCREAS.

Etiology.—The etiology of tumours of the pancreas is that of new growths in general. Most patients affected are about middle age. Primary cancer is more frequently met with in men than in women.

Pathological Anatomy.—The most common of the primary tumours is carcinoma (scirrhus, medullary, cylindrical-celled carcinoma); much less common are adenoma, sarcoma, tubercle, and gumma. Primary cancer is met with most commonly in the head of the pancreas; the duct is sometimes obliterated, and marked compression of the common bile-duct is also frequent. Perforation into the stomach is not very unusual.

Clinical Signs.—Intense, sometimes intermittent, pain in the epigastrium is often present. In more than three-fourths of all cases the infiltrated head of the pancreas

compresses the common bile-duct and causes jaundice and clay-coloured stools. It is not often that a palpable epigastric tumour is found ; if present it much assists the diagnosis. Such a tumour will usually have the pulsations of the aorta transmitted to it. Glycosuria and fatty stools have only rarely been recorded. Sometimes the pylorus is compressed and dilatation of the stomach caused.

Cachexia often occurs early, and once established it steadily progresses ; intense general weakness is also often an early symptom.

Diagnosis.—In a case of jaundice associated with distension of the gall-bladder, where symptoms of calculus are absent and a tumour is to be felt in the epigastrium which does not follow the movements of the stomach, a pancreatic new growth should be suspected (Körte). In obliteration of the bile-duct by calculus the gall-bladder is usually small and shrunken. Stomach tumours are associated with chemical changes in the gastric secretions, and gastric stagnation. Tumours of the colon may be differentiated from tumours of the tail of the pancreas by inflating the stomach and colon ; a tumour of the tail of the pancreas will present between the stomach and transverse colon.

INDICATIONS FOR OPERATION.

Körte has formulated the following indications : " If a tumour of the pancreas is discovered which is giving rise to symptoms, and if after careful and prolonged examination there appears to be a chance of removing it entirely, operation should be undertaken." Radical operation consists of extirpation through an abdominal incision. The palliative operations are the establishment of a biliary fistula, cholecystenterostomy, and gastro-enterostomy (for duodenal obstruction). Such measures will only be taken when the symptoms are intolerable ; when, for example, there is pronounced intestinal stenosis, with much suffering, or some other very troublesome symptom, such as intense pruritus from jaundice, and a distended gall-bladder.

Contra-indications.—Long-standing intense jaundice is a contra-indication to operation on account of the tendency to hæmorrhage and to the onset of severe shock. In the absence of jaundice no operation will be done when the

general condition is low, when metastases are present, or when the new growth has encroached on neighbouring organs.

Prognosis.—*Risks and results of operation.*—It is only rarely that a chance occurs of ridding a patient of a carcinoma of the pancreas, on account of the difficulties of early diagnosis; yet several successful cases have been placed on record. The risks of the operation are considerable; several patients have succumbed immediately after the operation, one case from gangrene of the colon. Cholecystostomy obviates cholæmia but produces all the inconveniences of a biliary fistula for the rest of the patient's life — discharge, eczema, etc. In 20 cases life was prolonged not more than three months after the operation in any one. Cholecystenterostomy may be followed by cholangitis; nevertheless, in one case the patient survived the operation 19 months, in another 12 months; operative death occurred in 2 cases out of 12. On the whole the palliative operations for pancreatic tumour do not give much satisfaction. One of my patients succumbed some weeks after opening the gall-bladder; he derived no real benefit from the operation.

Without operation.—In most cases carcinoma of the pancreas terminates in death from four to five months after the appearance of symptoms. Benign pancreatic growths may attain enormous dimensions, and cause intolerable suffering, particularly by compression of the bile-duct.

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CHAPTER XXII.

Diseases of the Kidney and Renal Pelvis.

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DISEASES OF THE KIDNEY AND RENAL PELVIS.

BRIGHT'S DISEASE.

Etiology.—Acute Bright's disease may follow one of the infective diseases or develop during the course of the same, or may be due to one of the intoxications, or may arise from an unknown cause. Chronic nephritis often supervenes on the acute disease, or may be due to some chronic infective disease (syphilis, tuberculosis), or to a chronic intoxication (alcohol, lead). Granular contracted kidney occurs from the same causes, but also from diseases of nutrition (gout) and from arteriosclerosis.

Pathological Anatomy.—In post-mortem examinations both kidneys have always been found diseased, but surgical autopsies appear to show that the disease is more often at first unilateral. The inflammatory condition is not always diffuse; sometimes it is circumscribed. The following forms have been distinguished: acute parenchymatous nephritis, usually associated with enlargement of the organ; chronic parenchymatous nephritis (the large white and the large mottled kidney), with secondary atrophy; and the genuine contracted kidney, with indurated patches, and often associated with marked endarteritis of the renal arteries.

Clinical Course.—Acute nephritis often runs an apyrexic course. Pain in the loin and tenderness on pressure are often to be noted. The amount of urine is usually diminished, high coloured, of high specific gravity, and contains much albumin, blood, and numerous granular casts beset with red cells and epithelial cells. Marked general œdema is usually, but not always, present. Cardiac hypertrophy

does not occur in the first weeks, but later is not uncommon. Uræmia often develops.

In chronic parenchymatous nephritis the amount of urine passed is usually but little less than normal, and of about normal specific gravity, containing albumin and blood in considerable quantity. The deposit contains numerous granular casts, blood corpuscles, and renal epithelia. Occasionally, but rarely, pure blood is discharged for a considerable time. Hypertrophy of the left ventricle is the rule, and albuminuric retinitis is frequently present. Uræmia is relatively uncommon in this form of nephritis. Exceptionally there occur cases of nephritis without albuminuria or casts, and characterized by the onset of attacks of colic and hæmorrhages. Such cases are of special surgical interest, and the condition appears to be usually unilateral.

In secondary and primary contracted kidney the arterial tension is high and the hypertrophy of the left ventricle pronounced. The urine is abundant, clear, and of low specific gravity; contains little albumin and few casts or renal elements. Cerebral hæmorrhage and advanced anasarca are common.

Spontaneous recovery often takes place in acute nephritis; in some cases death occurs from uræmia or heart failure, in others chronic nephritis supervenes. Chronic parenchymatous nephritis often produces intense œdema, and terminates fatally in the course of twelve to twenty-four months. The progress of the disease is often intermittent; in such cases periods of improvement are followed by acute hæmorrhagic exacerbations. When the condition passes into that of contracted kidney the duration of life is prolonged.

In the different forms of contracted kidney the patient's existence is threatened by cardiac insufficiency and uræmia; uræmia may have an acute or a subacute onset. The diagnosis of the different forms of nephritis is based chiefly on the urine examination.

INDICATIONS FOR OPERATION.

The question of operative interference in Bright's disease has been discussed for some years, but opinions still differ much as to the indications. Most writers are in agreement

on the following point: that in acute nephritis, where there is marked oliguria or anuria, when the general condition is good, and there is marked pain and tenderness on pressure over one or both kidneys, operation should be recommended (Lennander). The same holds true for acute and for acute exacerbating nephritis. The operation consists in exposing the kidney and removing the fibrous capsule (nephrolysis); many surgeons also make an incision into the kidney to relieve tension.

A second indication, not generally agreed upon, is the onset of acute unilateral or bilateral pain in cases of nephritis which have become chronic; here, too, nephrolysis is practised.

A third indication is the occurrence of attacks of hæmaturia associated with colic; in such cases operation is sometimes necessary to save life.

When acute uræmia supervenes, and anuria appears suddenly in the course of nephritis, operation should be undertaken, according to Israël, in the first forty-eight hours, whether lumbar pain is present or not. The operation will consist of incision of at least one kidney for the relief of tension. In acute uræmia, when operation for some reason or other is impossible, venesection is urgently called for, and must be repeated if necessary, and followed by the injection of large quantities ($\frac{1}{2}$ litre) of normal saline (Leube). When universal œdema is present and cardiac and diuretic remedies are ineffectual, the lower extremities should be scarified, or capillary trochars inserted to relieve the heart and overcome the local tension.

Contra-indications.—Direct operation on the kidney is contra-indicated by the presence of severe complicating disease, especially heart failure, atheroma, and organic heart disease, unless the renal condition immediately threatens death, as, for instance, when anuria supervenes. If the diminution in urine secretion is only slight, operation is not called for, since spontaneous improvement often occurs. Operation is not justifiable for hæmaturia of moderate amount and short duration.

Chronic uræmia with remissions and exacerbations contra-indicates repeated venesection.

Extensive eczema of the legs or inflammatory affections of the skin contra-indicate scarification; if done under

such conditions there is a risk of the eczema becoming acute and spreading.

Prognosis.—*Risks of operation.*—The patient must as a rule be anæsthetized for an operation on the kidney; the risk from the anæsthetic is relatively considerable on account of the changes in the heart muscle frequently present; the danger of heart failure is particularly great when uræmia with complete anuria has been present for several days. Even when done earlier the risk is not small, for the anæsthetic preparations, and particularly chloroform, exercise a deleterious effect on the renal parenchyma, and may intensify the inflammatory process.

It is not improbable that incisions into the kidney tissue are followed by secondary cicatricial contraction. In one case it was necessary to proceed to nephrectomy eight days after the operation on account of secondary hæmorrhage; in one instance gangrene followed operation. A urinary fistula may be left behind by the operation.

Puncture and scarification may be followed by erysipelas or phlegmonous inflammation, processes which are specially prone to affect patients with Bright's disease; repeated scarification may, however, be done without these affections supervening; in one of my own cases this was done more than a dozen times in six months without any such complication.

Results of operation.—In many cases of oliguria or anuria nephrolysis or incision of one kidney alone, although both were affected, has been followed by re-establishment of secretion and disappearance of the symptoms threatening the patient's life. Not only oliguria but also serious renal hæmorrhage has been sometimes permanently checked by intervention. In uræmia marked improvement is often produced by venesection and injection of saline solution; not infrequently the alarming symptoms disappear.

Scarification often remarkably improves the condition of the œdematous extremities, and, more important still, relieves the heart. In one of my own cases 29 litres of fluid came from the legs in two days. In many cases one has seen improvement in diuresis and diminution of œdema follow this small operation.

One case under my care was that of a young man who, following gonorrhœa, had high fever, and complained of

intense pain in the left loin. There were traces of albumin in the urine, pus corpuscles in the sediment, no casts. The kidney was markedly enlarged and tender to pressure. The fever persisted several weeks, suppuration was suspected, and the kidney was cut down upon; it was found only to be enlarged and dark red in colour, and on section the details of structure were obscured. After the operation the fever disappeared entirely and suddenly, the pains diminished, the albumin soon disappeared from the urine, and the patient made a rapid recovery.

Abstention from operation means in many cases that the patient is given up as hopeless, but in others is dictated by the prospect of relieving or possibly curing the patient without it.

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RENAL NEURALGIA

(*Nephralgia Hæmaturica, Angioneurotic Hæmaturia*).

Etiology.—There is no single etiological cause of these affections. The attacks are caused sometimes by changes in the kidneys themselves, sometimes by changes in their

surroundings, and sometimes are due to nervous affections (tabes).

Pathological Anatomy.—The many histological investigations which have been carried out on extirpated kidneys or portions of the organ have shown that in a considerable number more or less extensive nephritic processes are present. This inflammatory condition may be unilateral or bilateral, and it is sometimes the latter when the clinical signs are all referred to one side. Sometimes there is displacement or adhesions or torsion of the kidney.

Clinical Course.—Renal neuralgia is characterized by very intense paroxysmal pain, often associated with or followed by hæmaturia; the bleeding may consist of a single large hæmorrhage. The pain and hæmorrhage are limited to one side; in the intervals there is no albumin in the urine. In rare instances casts—hyaline, granular, or epithelial—are found, without albumin. The pain often radiates to the urinary bladder and the glans penis. The affection may persist for years; between the attacks there may be long periods of quiescence, extending to several years.

Diagnosis.—The attacks resemble those which are associated with calculus, tuberculosis, and new growths. If there are no signs which point to one or other of these morbid affections, such as calculi, tumour particles, pus, tubercle bacilli, etc., the diagnosis of renal neuralgia becomes probable by exclusion, but no certainty can be arrived at as to the actual anatomical change present. Rarely in granular contracted kidneys a similar train of symptoms occurs.

INDICATIONS FOR OPERATION.

If a probable diagnosis of renal neuralgia is arrived at; if the attacks are so frequent that the patient is insistent on relief; if frequent and profuse hæmorrhages are sapping his strength, and if internal treatment fails, an exploratory operation should be done and means taken to deal with whatever abnormality may be found, for example by the release of adhesions, by decapsulation, or fixation. If hæmorrhage is the predominant symptom, incision of the kidney is indicated. Operation is contra-indicated by the

presence of serious intercurrent disease, particularly cardiac disease.

PROGNOSIS.—*Results and risks of operation.*—In many cases operation has had a favourable influence on the condition, and not infrequently brings about complete relief. In some cases the attacks have recurred after a variable period: in six out of eleven of Israël's cases this happened. The risks of operation appear to be considerable; there is the risk of diffuse bilateral renal inflammation, increased by narcosis, and tending to produce a condition of uræmia, and there are the risks associated with degenerate heart muscle. Of the cases operated on by Israël, three died as a result of the operation. If no operation be undertaken, a very grave state of affairs may supervene from anæmia of high grade and continued attacks of pain.

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RENAL CALCULUS.

ETIOLOGY.—Hereditary tendencies play an important part. Gouty families are often affected. The condition is common above the average in certain localities; it is most frequent in children up to the age of five years, and in men from the age of forty upwards. Foreign bodies (distomum and fragments of tissue débris), and traumatic hæmorrhages may act as causative factors. The catarrh of the urinary passages associated with affections of the spinal cord predisposes to calculus. Renal and biliary calculi have often been found present simultaneously in

the same patient. The *Distomum hæmatobium* is an important etiological factor in tropical countries.

Pathological Anatomy.—The number of calculi in a kidney varies from one to several hundred. The oxalate stones are usually single; the multiple stones are usually composed of urate and phosphate. In more than half the cases one kidney alone is affected, particularly the left. Calculi may be spherical or cylindrical or branched, sometimes ring-shaped; they may reach the size of a walnut. They are almost always in the pelvis, calices, or ureter, very rarely in the parenchyma. Most common are the yellow brown uric acid stones, next the dark grey mulberry oxalate, then the greyish white phosphate; rare forms are composed of calcium phosphate and carbonate, cystin, xanthin. When the condition is bilateral the composition of the two calculi is sometimes different. Associated with the calculus there is sometimes incrustation of the renal pelvis with calcium phosphate.

The renal changes may be aseptic or infected. The aseptic changes consist of chronic interstitial inflammatory processes of the renal tissue, processes due to retention of the urinary secretion, and hyperplasia of the two capsules. Israël speaks of the large hard calculous kidney, the shrunken calculous kidney, the hydronephrotic calculous kidney with and without hypertrophy, and of the lipomatous calculous kidney. The fatty capsule is often thickened and adherent to the capsula propria, and this fibroid change may extend to the connective tissue of the kidney itself.

A calculous kidney may be infected either by way of the blood stream or from the bladder, more often the former; a peri- and paranephritis follows, either of acute purulent or chronic type; the condition of the kidney itself is one of pyelitis or pyonephrosis. If a calculus block the ureteral channel, hydronephrosis develops, or pyonephrosis if the urine is infected, with general atrophy of the renal tissue.

The opposite kidney is sometimes hypertrophied. General pyæmia does not often occur from calculous pyelitis. When the condition is of long standing the other kidney is almost always altered (inflammation, suppuration, sclerosis, atrophy, etc.). Of 76 cases collected by Legueu, in 36 the

other kidney contained no calculus, but in 31 there was some other affection of the opposite organ.

Ureteral stones sometimes form a complete cast of the ureter. They are usually single and most frequently in the lower part of the channel, where they may be palpated from the vagina or rectum.

Clinical Signs.—A renal calculus may be present for a long time without giving rise to symptoms. Usually they are attended by a dull pain in the loin increased by pressure on the abdomen, by movement (walking, jumping, riding, etc.), and by lumbar compression. The pain often radiates along the course of the ureter, and is frequently referred to the glans penis and is associated with violent tenesmus. I have several times noted anæsthesia or hyperæsthesia of the skin along the course of the ileo-hypogastric nerve.

Between the attacks of colic the urine may be entirely clear; violent exercise may cause a blood tinge to appear, or the amount may be only microscopic, and be found in the sediment as washed-out red cells. Profuse hæmaturia without colic is more frequent in the early than in the later stages. In the intervals a brick-red sediment or a sediment of phosphates is not uncommonly found. If the calculi are large and numerous, they may sometimes be felt on palpation, provided the abdominal wall is thin. Radiography gives a shadow which varies in density according to the composition of the calculus.

The attacks of colic are of excessive severity, and may come on without warning, or be preceded by slight prodromal symptoms. The pain is usually lumbar, but may be ill-defined; it radiates most frequently to the testicle, less commonly to the thorax and shoulder. There is frequent and painful desire to make water, and at the commencement of an attack rectal tenesmus and vomiting; meteorism is also common. Later, but occasionally at the beginning, there is insuperable constipation, with constant fruitless tenesmus.

The amount of urine is small, and after a time complete anuria may come on: either a true reflex anuria, or bilateral blocking of both ureters, as in a case of my own which was examined post mortem. Reflex anuria may last for several days, and cause death by uræmic poisoning. In one of

my patients, after five days' anuria, the urinary secretion returned copiously, the other kidney showing no permanent lesion. In other cases the amount of urine is only lessened; it is turbid, and contains blood and muco-pus; but if one kidney is blocked, the urine passed, coming from the other side, may be clear and abundant.

The duration of an attack may be from an hour to several days, and it may or may not be accompanied by fever. If the calculus passes into the bladder, or backwards into the renal pelvis, the pain ceases abruptly. After an attack small concretions or gravel are often discharged; blood corpuscles are almost always found in the urinary sediment; traces of albumin are also present, and occasionally hyaline casts.

Long-established calculous disease is almost always associated with inflammatory changes in the renal pelvis, and pus in the urine to a greater or less extent. Such a pyelitis may eventuate in perforation of the pelvis and the formation of a perinephritic abscess. In other cases the kidney becomes pyonephrotic.

During the attacks the kidney is swollen, but not usually to such an extent as to be noticeable on palpation. When the attacks are frequent, and a hydronephrotic or pyonephrotic condition is established, the enlargement is marked and permanent. Israël found that in 30 cases of renal and ureteral stone not associated with hydro- or pyonephrosis, in 17 the kidney could be felt enlarged on palpation.

Diagnosis.—When a calculus is evacuated after an attack of colic the diagnosis is simple and clear. In other cases it is difficult and is founded on a careful consideration of the history, on the presence of marked tenderness on bimanual examination, on the constant occurrence of slight or considerable hæmorrhage after exertion, on the presence in the urine of albumin, pus cells, crystals, and sometimes casts, on the radiation of the pain to the penis or testicle, on sensory disturbances in the course of the ileohypogastric nerve, and on the positive results of radiographic examination. The oxalate and uric acid stones give a dense shadow; the phosphatic are much less satisfactory in this respect.

I think it necessary to utter a warning against basing the diagnosis only on a radiographic picture; in a case which I saw in consultation with others of pain in the loin

and occasional microscopic traces of blood in the urine, a radiograph showed what was apparently a distinct group of facetted calculi, but operation showed no calculus in either pelvis or ureter ; possibly the sharply-defined shadows were due to uric acid infarcts in the renal pyramids.

In other cases radiography is of much assistance in support of the diagnosis when the symptoms are not typical.

Ureteral catheterization for purely diagnostic purposes is too risky a proceeding for routine use.

Differential diagnosis is sometimes very difficult. Chronic appendicitis may simulate nephrolithiasis, but the characteristic radiation of the pain is absent, and there are no changes in the urine, although there may be dysuria.

In attacks of biliary colic without jaundice the gall-bladder is enlarged and tender, and the physical diagnosis is made easier if the patient is turned over on to the left side. In intestinal colic there is no tenderness on pressure in the painful area. Local examination will usually exclude disease of the genital organs. In ulcer of the stomach or duodenum the situation of the pain is away from the kidney, and there are no urinary changes. Colic due to sudden distension of the renal capsule may be confused with nephrolithiasis. In occlusion of the ureter causing hydronephrosis the organ is much enlarged, and when the obstruction is relieved hæmaturia often occurs, the kidney returning to its normal size. In renal tuberculosis pus and albumin are usually persistently present in the urine ; sometimes the bacilli may be demonstrated and fever is frequent, while characteristic changes at the ureteral orifices may often be demonstrated by the cystoscope. Torsion or dislocation of a floating kidney may usually be distinguished by a careful physical examination and attention to the history.

In pyonephrosis the urine is often clear during an attack of colic and full of pus after it has passed. Renal tumours are usually not tender to pressure ; the hæmorrhages to which they give rise usually occur suddenly, without reference to exertion or movement, and clots are often passed.

Hysterical nephralgia can sometimes only be distinguished from stone by the constant absence of blood cells and albumin from the urine.

INDICATIONS FOR OPERATION.

Under some circumstances renal calculus threatens life, and operation is then absolutely indicated. This is the case in the presence of *calculous anuria*, a condition which may be due to bilateral occlusion of the ureter, or to occlusion of one and reflex inhibition of the opposite kidney, or to the occlusion of one ureter when there is but one kidney. Spontaneous disappearance of reflex anuria, after treatment with drugs, hot baths, etc., is improbable when the pains of colic have ceased, and when after the cessation of colic the patient still does not pass urine.

Disorganization of the renal parenchyma, leading to fatal uræmia, frequently sets in by the third day, although it may be delayed to the sixth or even the tenth, so that the possibility of spontaneous disappearance in calculous anuria must not be relied upon for longer than twenty-four hours after onset.

On which side is the operation to be done ?

When there is unilateral nephrolithiasis the affected kidney is to be dealt with ; when bilateral the kidney which appears from clinical signs to have been last occluded, because the onset of complete anuria will have been due to this. If the clinical symptoms and the radioscopic examination do not afford any definite information (for example, when coma supervenes without antecedent colic), that kidney should be operated on which, judging from the history, it seems probable has suffered least destruction. If no calculus is found on the one side the other kidney should then be exposed if uræmic symptoms are actually present, but if the uræmia has not at that time come on the second operation may be postponed a day or two, because sometimes incision on the one side reflexly relieves the opposite kidney. If, however, at this operation the kidney is found much altered although there is no calculus, the other kidney should be at once incised even though there is no present uræmia.

The difficulties that may arise are illustrated by the following case. In a man, aged 40, after shooting pains along the course of the ureters and slight transient hæmaturia, anuria suddenly came on, with intense vesical tenesmus. The left kidney was found enlarged and tender.

Operation was done on the third day; a large calculus was removed from the left side, and this kidney at once resumed function. The next day anuria came on again, and soon passed into fatal uræmia before a second operation could be done. At the autopsy a calculus was found blocking the right ureter; there were no symptoms during life pointing to the right side.

A second absolute indication for operation is the onset of symptoms pointing to *acute pyelonephritis of one kidney*. Such symptoms are :—Fever, sometimes pyæmic in character, with frequent rigors and profuse sweating, dry tongue, vomiting, marked pain and tenderness on pressure in the region of the kidney, pus, and occasionally hyaline and granular casts in the urine. Even if fever is absent and the general condition is not seriously affected, operation is indicated when the urine contains pus and the cystoscope shows that this is coming from one side.

A third absolute indication is the onset of *hæmorrhage* in renal calculus in such quantity as to threaten life; this, however, rarely happens. A fourth absolute indication is met when a *calculus is impacted in the ureter*, and has remained there for some considerable time; such cases always terminate either in retention or infection if left alone.

Operation is further indicated, although not as an *indicatio vitalis*, in the following conditions :—

(*a*) When hydronephrosis and calculus co-exist, because the first is often provoked by the second. If such a calculous hydronephrosis becomes infected and pyonephrosis supervenes, removal of the kidney is urgently called for.

(*b*) Even when the symptoms are slight, pus in the urine is a sign which indicates operation, whether the kidney is enlarged or not.

(*c*) When the patient has to work for his living, and is prevented from doing so by continuous dull pains or repeated colic, with or without the passage of calculi. This indication holds whether the calculous kidney is infected or not.

(*d*) In patients better situated, when there is much complaint of pain and distress and consequent mental depression.

(*e*) When a patient lives or travels out of the reach of surgical assistance; in particular when he has already had pronounced attacks of colic, and radioscopy shows a stone present.

Almost all authors are agreed that the conditions which I have enumerated should be accepted as indications for operation. Others, for example Rovsing, Tuffier, and Henry Morris, go further; they consider operation called for in all cases where a definite diagnosis of renal stone can be made, whether the condition is aseptic or infected, simple or complicated. Other surgeons operate even when the question of the presence of stone only amounts to a reasonable probability; they hold that the dangers of delay are greater than those of prompt operation, and that to wait for signs of infection is to increase the risks of operation.

This latter opinion probably goes too far, and the practitioner should not base his advice as to operation upon it without hesitation. Operation even on a non-infected, uncomplicated, and "silent" kidney, is not so free from risk as some of its advocates argue. Rovsing admits a mortality of 7 in 115 cases. One cannot, therefore, promise the patient that such operations are free from risk, since, as Israël remarks, the prognosis of each case has some uncertainty about it, even though statistics show that no other major operation can show so small a mortality (Morris). It is a fact that the presence of a renal stone is compatible in many cases with long life and good health, even when there are occasional slight attacks and hæmorrhages. This is my own experience, and it is supported by Rosenstein, and I may express my opinion on the matter by saying that, in my view, the presence of a renal stone does not in itself constitute an indication for operation, but that some one of the complications already mentioned should be present before operation is recommended.

The operation most frequently employed is nephrotomy, with incision through the renal cortex, less frequently through the wall of the pelvis. Extirpation (when the kidney is completely disorganized by suppuration) and partial extirpation are only rarely called for. According to Küster total extirpation is required under the following conditions :—

(*a*) Atrophy of the parenchyma, owing to the presence of numerous large calculi.

(*b*) In sacciform purulent kidneys, and when pyelonephritis has largely destroyed the organ.

(*c*) In septic paranephritis around a kidney more or less disorganized.

(*d*) In persistent fistula after nephrolithotomy.

(*e*) In stenosis of the ureter after nephrotomy, which cannot be treated by other means.

Contra-indications.—According to what has been already said, when the attacks are infrequent and slight, no operation is called for. Even when small stones are passed repeatedly with or without colic, operation is not indicated if the patient is quite well in the intervals, and the urine is clear and contains no renal-formed elements. Operation cannot influence the disposition to the formation of fresh calculi (Israël). Bilateral non-infected nephrolithiasis is not a contra-indication to operation, but it is otherwise with double infected calculous disease, especially if the general condition is bad. Advanced age is also a contra-indication.

Prognosis.—*Risks of operation.*—The risks vary with the nature of the operation and the state of the kidney. The operative mortality in non-infected calculous disease amounts only to a small percentage, but in the infected form it is very high (as much as a fourth of all cases), whether for nephrolithotomy or nephrectomy. Death occurs usually from heart failure or uræmia. Operation is sometimes followed by urine infiltration, septic paranephritis, and sometimes gangrenous inflammation of the soft parts. Occasionally serious post-operative hæmorrhage has occurred.

In 61 cases of nephrolithiasis without anuria operated on by Israël, the operative mortality was 14·7 per cent, and one later accidental death. Of 12 with calculus in the ureter 4 died, of 5 with calculous anuria two died. The operative mortality is lowest (1 in 29) in aseptic or only slightly-infected cases, highest in highly-infected cases when conservative operations are done (38 per cent), so that in the latter class *nephrectomy is indicated as the least dangerous procedure.* Küster collected 493 cases of unspecified types treated by nephrotomy, and of these 90 (18 per cent) died after operation; of 193 treated by nephrectomy 44 died (over 20 per cent).

After operation, and particularly after pyelolithotomy, fistulæ sometimes persist for a long time; in some cases fæcal fistulæ have been recorded from operative lesion of

the intestine. If the kidney is split, some of the parenchyma must atrophy, though the amount may be small; different authors have held the opinion, and in my view with reason, that such loss of substance is not insignificant from the point of view of the renal function.

Results of operation.—Having laid stress on the risks and mortality of operation, it is right to state that many cases are completely and permanently cured of their disease. It appears that the formation of fresh calculi after operation may be avoided by suitable dieting. Israël states that in his experience re-formation is rare in the case of uric acid and oxalate calculi.

Without operation.—If operation is withheld in the presence of what have been enumerated above as absolute indications, death will occur from heart failure or uræmia, or there may develop a state of general infection from the infected kidney. In a kidney whose ureter is blocked by a stone, desquamative processes usually take place which may damage the function of the organ, and this damage may persist after the stone is gone. In other cases, when there is marked pyelitis, the condition may spread to the whole of the urinary passages and the other kidney, and induce amyloid disease. In acute pyelonephritis of one side, severe toxic infection may be induced on the other side and seriously endanger life.

Under the conditions which have been enumerated as relative indications, the patient, if no operation is done, may become quite incapable of work, and his life may be a burden to him on account of persistent pain.

When hydronephrosis develops from retention in a calculous kidney, the parenchyma will atrophy from pressure unless operation is done to relieve the block. If the hydronephrosis becomes infected, and operation be withheld, the one kidney becomes disorganized, and secondary infection may occur in the other.

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RENAL CONTUSIONS.

Etiology.—The accident which usually produces this lesion is a blow in the lumbar region. Blows inflicted more laterally or anteriorly may also cause it, or forcible compression between two resistances. Occasionally it is due to sudden forcible contraction of the abdominal muscles. As a rule one kidney only is affected.

Pathological Anatomy.—The lesions vary in extent. There may be simply a splitting of the capsule, or there may be a tear in the kidney substance without involving the pelvis, or the tear may extend through into the pelvis. Sometimes part of the kidney is completely separated, especially in lesions near the poles. The hæmorrhage is always considerable, and the renal pelvis is usually full of clots. Secondary abscesses frequently develop in or around the kidney.

When the injury is very severe the whole kidney may be destroyed, in which case a gangrenous condition supervenes if the patient survives. Occasionally the pelvis is torn away from the kidney proper, or the ureter and other structures of the hilum may be torn through; if the artery and vein are torn the whole kidney necroses.

Symptoms.—The general symptoms are shock or profound collapse, vomiting, and profuse perspiration; they may appear at once, or come on some hours after.

Locally, there is blood extravasation into the loin, and

later, days, or it may be weeks after, into the skin in the region of the inguinal canal. Usually there is intense local pain, generally much increased on movement. If clots pass down the ureter, pain radiates to the testicle, the hip, or the groin, and the testicle is retracted. These pains are often very persistent, and may last for weeks.

There is usually blood in the urine, and when there are clots great pain may accompany its passage. At the same time symptoms of severe internal hæmorrhage may develop and prove fatal, but death is exceptional from this cause within the first twenty-four hours; when it occurs it is due to the fall in blood pressure produced by the state of shock.

When the acute symptoms have passed, a condition of traumatic nephritis may be left, signalized by the presence of albumin and casts in the urine.

Immediately after the accident there may be oliguria, and in some cases this amounts to a reflex anuria; occasionally polyuria has been recorded. Marked meteorism is present in many cases.

If the peritoneum be torn and urine find its way into the peritoneal cavity the patient may die from septic peritonitis.

Diagnosis.—Contusion of the kidney is to be diagnosed when a lumbar or abdominal injury is followed by swelling and tenderness on pressure in the loin, hæmaturia in greater or lesser amount, and meteorism of the large bowel. If the pulse and temperature rise gradually, and if the abdominal pain extends and increases, extravasation into the peritoneal cavity is indicated.

INDICATIONS FOR OPERATION.

If after an injury there are signs of serious renal hæmorrhage, operation is called for. Such hæmorrhage, without being copious at first, may be continuous, and in this way become serious in itself after some days or even weeks. Operation consists in nephrotomy and arrest by packing; if the organ is much damaged it must be removed. If the signs point to the peritoneum being involved, a transperitoneal operation will be advisable.

Operation may also be called for on account of the onset of signs of inflammatory reaction around the kidney;

such signs are increase in the local pain and tenderness, fever, and perhaps rigors. When operation reveals a collection of septic urine or pus around the kidney, nephrectomy is the only procedure from which a good result is to be expected.

Contra-indications.—The presence of pronounced shock from serious lesions to other organs makes it necessary to postpone operation for the renal condition. It is unnecessary to operate simply for slight hæmorrhage of short duration, because minor renal contusions often heal spontaneously; nor should operation be undertaken simply on account of the presence of a hæmatoma in the loin, unless this becomes progressively larger, is associated with anæmia, or shows signs of infection.

PROGNOSIS. — *Results of operation.* — In many cases packing of the wound in the kidney or nephrectomy has given excellent results. Schede has collected 16 cases of nephrectomy for serious hæmorrhage, with 14 recoveries.

Without operation.—Of 306 cases collected by Maas and Küster, in 222 the condition was uncomplicated by lesions of other organs, and among these there was a mortality of 30 per cent. A half of all the cases taken together ended fatally. The deaths due to shock all occurred within 24 hours. Hæmorrhage was the cause of death in about half the fatal cases; in some the death took place late, but in most within a month. Septic infection accounted for most of the other fatalities, and most frequently within the first four weeks.

These figures show that the prognosis of renal injuries is always very serious, on account of the risks from hæmorrhage or infection. Recovery is often also incomplete; long-persisting fistulæ may be left, and hydronephrosis may occur from dislocation of the organ. Interstitial nephritis and calculi also occur as sequelæ.

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MOVABLE KIDNEY.

Etiology.—Congenital anomalies are the most important etiological factors in this condition. Other, and for the most part, contributory causes, are relaxation of intra-abdominal support (from repeated pregnancy, rapid wasting, the removal of large abdominal tumours, or the development of large ventral herniæ), vertebral scoliosis, injury, severe muscular exertion. The condition is also ascribed to tight-lacing and the wearing of high-heeled shoes. It also occurs from increase in weight of the kidney itself, and when the diaphragm is pushed down from one cause or another.

Pathological Anatomy.—The movable kidney may or may not be surrounded by its fatty capsule ; it usually rotates in its descent, so that the hilum looks upwards, but this may not occur if the vessels are long, extensile, or implanted low. The displaced organ may be fixed by perinephritic adhesions. Hydronephrosis is relatively common, torsion of the pedicle relatively rare. Many cases have been recorded complicated by inflammatory changes in the appendix.

Clinical Signs.—Most patients with movable kidney suffer no inconvenience, and it is often discovered by chance. Sometimes the symptoms are extraordinarily manifold, but many may be due to other morbid conditions present: enteroptosis, disease of the genital organs, etc. Israël places the symptoms in three groups :—

1. Pain on standing, walking, sitting, which disappears when the patient lies down.

2. Dyspeptic symptoms of the "nervous" type.

3. Attacks of typical renal colic, which must be looked upon as due in part to kinking of the ureter and in part to circulatory disturbances evoked by twisting of the vessels.

The attacks of pain are violent, and come on suddenly, associated with faintness, collapse, nausea, cold perspiration, and a small, rapid pulse. The kidney is felt to be enlarged and tender to pressure. In many cases the attack passes off suddenly, and is followed by polyuria. When attacks are often repeated the condition takes the form of periodic hydronephrosis.

If the attacks of pain caused by renal mobility do not soon disappear when the patient lies down and the kidney is replaced, or if they occur during rest in bed, there is reason to suspect that the condition is due to some organic renal disease, or to disease in some other abdominal organ, or to some form of neuropathy. According to Stiller there is often some abnormal mobility of the tenth rib. The condition is often bilateral; when unilateral the right is more frequently affected than the left.

Diagnosis.—The diagnosis is easy when the kidney is to be felt out of its normal position and can be replaced. When lying in its bed a movable kidney descends abnormally low during inspiration and can be easily displaced downwards with the hands. If the tumour corresponds with the kidney in size and shape, and is smooth on the surface, and if the vessels of the hilum are palpable, the diagnosis is clear. Confusion with other structures frequently occurs; a detached lobe of the liver presents a sharp edge at least at one of its borders, and if the patient is examined lying on the left side the right kidney will be felt in place. An enlarged gall-bladder with a long pedicle may be displaced from right to left but not downwards, nor can it be manipulated into the renal region; in spite of this such cases may present great diagnostic difficulties. Tumours of the ascending colon are associated with colic and are not always easy of palpation, but can usually be distinguished from movable kidney by careful examination; the distended gut will be seen to collapse with loud intestinal gurgling, and the tumour itself is movable in a transverse but not in a sagittal direction. Pyloric tumours are distinguished by an examination of the gastric function and by distension of the stomach. An ovarian tumour will be differentiated by the pelvic connections of its pedicle.

INDICATIONS FOR OPERATION.

The indications for operation in movable kidney have been with reason considerably restricted of late years, since it has been recognized that the condition is often present without causing any inconvenience, and that many symptoms previously ascribed to it are really due to affections of other organs. A movable kidney in itself, therefore, constitutes no absolute indication to operation.

Formerly also movable kidneys have been removed, but this is now recognized as absolutely inadmissible, and if operation is necessary nephropexy is performed.

Operation is required when the patient suffers from severe attacks of colic, with transient or persistent retention, as the result of kinking or twisting of the pedicle. When, again, a patient suffers considerably from symptoms which must be ascribed to a movable kidney, and when there is no well-established neuropathic condition present, fixation of the kidney by suture is advisable, provided that treatment by diet, apparatus, and hygienic régime has been tried and failed.

Contra-indications.—In the absence of the more serious symptoms due to interference with the renal functions by torsion and kinking, operation will not be recommended until other treatment has been tried. If a nervous individual attributes a whole series of vague troubles to a movable kidney, operation should not be done simply because she desires it, because the suggestive effect of such operation is often of very transient benefit. Operation will not be done on a movable kidney when there is some complicating disease of the digestive or genital system, nor is it advisable, according to the opinion of many surgeons and physicians, when the condition is only a part of a general enteroptosis.

Prognosis.—*Results of operation.*—The operative mortality of nephropexy is 1·18 per cent in a total of 846 cases; some surgeons have had a mortality of 3 per cent. Küster has reported two cases of pulmonary embolism immediately following operation. Nephrectomy for the condition is never now done; it was attended by a large mortality, more than 25 per cent in the cases published. Hæmaturia, albuminuria, and oliguria have been described as sequelæ of the operation, and in a few cases severe peritoneal irritation, post-operative hæmorrhage, and urinary fistula. In several instances it has been recorded that the opposite kidney has subsequently become mobile.

The success obtained by operation is not entirely encouraging. In 34 non-complicated cases 85 per cent were cured, but in 47 complicated cases the percentage was only 44; if the two groups are combined the cases form 58 per cent. Satisfactory results are especially

obtained when the condition is associated with some nervous taint, and in these suggestion no doubt plays a part. In particular the immediate result is good in these cases, but the late result often leaves much to be desired. The operative result is by no means always good, and in the hands of some surgeons the percentage of return of mobility is high.

Without operation.—In many cases the symptoms can be relieved by appropriate palliative treatment, bandages, belts, and massage. In a very small number serious complications sometimes supervene, such as hydronephrosis, new growth, and calculi. Death from collapse or peritonitis is excessively rare.

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CHAPTER XXIII.

Diseases of the Kidney and Renal Pelvis (*continued*).

Chapter XXIII.

DISEASES OF THE KIDNEY AND RENAL PELVIS (*contd.*).

TUMOURS OF THE KIDNEY.

Etiology.—Injury and calculous disease are sometimes concerned in the etiology of renal new growths. The malignant growths, and carcinomata in particular, are comparatively common in childhood; more than a third of the cases of carcinoma and two-thirds of the cases of sarcoma belong to the first ten years of life. Renal new growths are also comparatively frequent between the ages of 50 and 70.

Pathological Anatomy.—Both malignant and simple growths occur in the renal tissue; the pelvis is the seat of origin in a few cases only. Primary carcinoma and sarcoma usually lead to enlargement of the kidney, but the organ may be destroyed by growth without notable increase in size. Carcinoma is often nodular in growth, and the tumour may present to the touch a very irregular outline; the growth often makes its way into the venous channels, and may extend in this way right into the vena cava. Some forms of growth are less nodular than infiltrating in character, and may have extended to a considerable extent into surrounding structures before any tumour is clinically demonstrable. The lymphatic glands of the neighbourhood are seldom affected; Israël found enlarged glands in only 7 out of 44 cases operated on, although several were considerably advanced. The most common type of carcinoma appears to be the adenocarcinoma.

Sarcomata are usually round-celled or spindle-celled, and may be single or multiple.

Other forms of malignant growth are the endothelioma and perithelioma, and the embryonal adenosarcoma of

childhood. The hypernephroma (Growitz) is sometimes simple, sometimes malignant. Of the benign growths, for the most part it is only the uncommon lipomata and fibromata that reach large dimensions. Israël computes that 70 per cent of the circumscribed cases develop about the lower pole and the middle section of the kidney.

Clinically the aneurysms of the renal artery have been classed with the tumours; usually they are small, occasionally very large; true and false aneurysms have been described.

Clinical Course.—The most important clinical signs of malignant tumour are hæmaturia, enlargement of the kidney entirely or principally of solid character, pain, and, later, cachexia and metastasis. Hæmaturia is often the initial symptom; it occurs as such in a fourth of all cases, and in later stages is present in a half. In Israël's cases early hæmaturia, with or without colic, was present in 70 per cent, and of 66 cases only 5 had no hæmorrhage. The bleeding is sometimes slight and infrequent, sometimes first follows an injury, but for the most part it is considerable and even profuse. It is usually symptomless, has no relation to exertion or position, and varies extremely in frequency. In one of my cases a very severe hæmorrhage, producing marked anæmia, occurred three years before the appearance of a tumour. Usually the blood is passed mixed with the urine, sometimes in clots which may cause colic during their passage, and may even block the ureter and cause hydronephrosis, though this is rare. The urine may show no abnormality except the blood, and the passage of fragments of growth is unusual, but with or without blood there is usually albuminuria, sometimes of advanced grade. Casts are often present, coming from that part of the kidney involved in the aseptic inflammation which accompanies the new growth.

Israël describes as a characteristic sign the presence of worm-like coagula enclosing red cells, large granular corpuscles, atypical epithelia, and detritus derived from destroyed red cells in a fibrinous ground substance.

In the later stages a palpable tumour is almost always found; the date at which this is discovered depends upon the skill of the examiner and the position of the tumour in the kidney. Tumours of the lower pole or front surface

are relatively easily felt; examination is best carried out in half lateral decubitus. Malignant tumours are as a rule irregular, firm, and nodular, and often tender to pressure. Israël has often recognized by palpation quite small tumours, down to the size of half a cherry. As the tumour grows the neighbouring organs are pressed upon and the diaphragm may be pushed upwards; intestinal resonance is found in front of the mass.

In about a quarter of the cases there is initial pain in the kidney region and along the course of the ureter; this is sometimes dull, sometimes most intense. On the side where the tumour is situated a varicocele often develops, sometimes œdema of the lower limb and swelling of the inguinal glands. Fever is occasionally present; cachexia appears late. The duration of the disease is, in children, usually only a few months, seldom a year; but in adults it is sometimes prolonged up to even 10 years, with a mean of about $2\frac{1}{2}$. The course is, therefore, more prolonged than is usual in carcinoma elsewhere (Robert). Death occurs from cachexia or hæmorrhage, rarely from uræmia or rupture of the kidney.

Diagnosis.—In presence of the cardinal symptoms—hæmaturia, tumour, and lumbar pain—the diagnosis is easy; intermittence in the hæmaturia is a helpful sign, and tumour particles may be found in the urine. Careful bimanual examination, distension of the colon and of the stomach, examination of the rectum and vagina, radioscopy and cystoscopy, will decide whether a tumour is renal or not.

If hæmaturia is the first symptom diagnosis must be made from tuberculosis and calculus, and also from hydronephrosis, cystic kidney and hæmorrhagic infarct. The absence of tubercle bacilli, of characteristic nightly fever and perspirations, and the negative result of a tuberculin injection, will decide against tuberculosis. Cystoscopic examination of the ureteral orifice will also be of much assistance. In renal stone there is not, as a rule, a large tumour, colic is always associated with the hæmorrhage; there may be a history of the passage of calculi previously, and radioscopy will materially assist. Congenital cystic kidney is often associated with hæmaturia, but the condition is usually bilateral, whereas new growth is almost always unilateral. The tumour of hydronephrosis is regular on

the surface and elastic; it is rarely associated with hæmaturia in any quantity, and is often intermittent and varying in size from time to time. In children enlarged retro-peritoneal glands may simulate renal tumour, but the absence of changes in the urine and careful examination will not fail to make the case clear.

INDICATIONS FOR OPERATION.

If the presence of a malignant neoplasm of the kidney has been definitely ascertained by observation of the cardinal symptoms, or if the question amounts only to a great probability, provided that the other kidney is functioning, operation should be undertaken. The operation is exploratory if the diagnosis is uncertain; when tumour is present total extirpation of the organ is the rule. There are cases in which, in spite of the presence of metastases, operation is still indicated, in particular when profuse hæmorrhage threatens life, provided that cachexia is not too advanced. I have seen one case where this *indicatio vitalis* called for operation.

Contra-indications.—If metastases are present (the skeleton should be examined for them), if the growth is bilateral, and if the tumour is immovably fixed to its surroundings, operation is inadvisable. Signs pointing to obstruction of the vena cava inferior also negative operation, because they indicate that the tumour has extended to this channel. Any serious complicating affection, such as diabetes, also excludes operation. If fever is present without apparent cause it is against operation, because it only occurs in renal growths when they have extended beyond the limits of the renal capsule. Complete absence of function in the other kidney excludes operation, but not if the function is only in part interfered with, as by amyloid disease or chronic nephritis; operation is justifiable under such circumstances in view of the hopelessness of the disease without it.

Prognosis.—*Results of operation.*—The end results of extirpation for tumour are unhappily not very favourable. Israël found that of 25 patients who had survived operation and intercurrent affections, 19 succumbed to recurrences; many of Israël's cases were operated on at comparatively early stages. Favourable results have, however, been

obtained in many cases. At the least, operation improves the patient for a time, relieves him of pains, and may enable him to return to work.

Risks of operation.—Many patients operated on succumb to heart failure. Among 43 of Israël's cases 5 died from this cause and 4 from some other condition due to the operation. According to Héresco and Israël the operative mortality is about 20 per cent. Disease of the opposite kidney is relatively rarely the cause of death.

Without operation.—Patients with malignant disease of the kidney inevitably die unless rescued by surgery; yet the duration of life is sometimes as much as several years. It is not very unusual for such patients to live about four years, and in a sixth of the cases the period actually extends to ten years. In one of my cases seven years elapsed between the first hæmaturia and death; the patient refused operation when the disease was in its early stages.

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CYSTIC KIDNEY.

ETIOLOGY.—Cystic kidney is a congenital affection in the majority of cases; in adults it is usually found only after maturity; of 187 cases two only belonged to the second decennial period. Several instances have been recorded of its occurrence in more than one member of a single family.

PATHOLOGICAL ANATOMY.—It is almost always a bilateral condition in congenital cases and young children. In older subjects the records show it to be bilateral in about four-

fifths. The affected organ is usually much enlarged; it is riddled throughout with cysts of various sizes. It may present the characteristic renal shape or may form an irregular-shaped nodular tumour. The cyst contents are sometimes clear and yellow, sometimes turbid, and not infrequently hæmorrhagic. In a third of the cases the condition is associated with cystic disease of the liver. The causation of the disease has been ascribed to a chronic inflammatory change; others consider it of the nature of a malformation, while others again look upon it as due to true new growth.

Clinical Signs.—Congenital cystic kidney is not of much surgical importance for the reason that most of the children with this affection die early from pressure on the diaphragm or some other malformation. In adults it often runs its course without giving rise to symptoms, and sometimes is found accidentally at a post-mortem examination, as in two cases under my care whose urine showed no abnormality. Occasionally the enlargement is so marked that it can be recognized by palpation, and it may even be possible to make out individual nodular cystic swellings on the surface of the tumour. Pain is sometimes a symptom, sometimes not; occasionally it is colicky in character.

The urine is often normal, but sometimes contains albumin and blood in quantity; it may also contain corpuscles of rosette shape, or resembling leucin. In some cases the urine is like that of chronic interstitial nephritis. Exploratory puncture shows that the bulging nodules contain fluid, and in this may be found the concentric or rosette-shaped bodies.

In many cases it will be found that the liver is enlarged and it may be possible to make out fluctuating areas in it. Cardiac hypertrophy and increased arterial tension are often present; usually the general condition is good, but there are occasionally digestive troubles and fever. The latter usually means suppuration in the cysts, but may be present without it. In one of my cases there were frequent rises of temperature without apparent cause, and the autopsy revealed no focus of suppuration to account for them; possibly they were due to uræmia.

Severe uræmic attacks are common, and death may result from this cause.

Diagnosis.—The diagnosis may be difficult. It is indicated by the presence of a bilateral renal tumour with irregular surface and fluctuating areas, particularly if associated with periodic hæmaturia and with simultaneous enlargement of the liver of a similar type. A history of a similar condition in some other member of the family should be enquired into. The rosette-shaped corpuscles appear to be diagnostic of the condition ; they are apparently found in no other renal affection.

Hydatid cyst of the kidney is usually unilateral, and the same is true of other renal tumours, and when bilateral the enlargement of both kidneys is never simultaneously the same as may be the case in cystic disease.

Differentiation from pyonephrosis and hydronephrosis may be very difficult, as these affections may be bilateral, but in these the surface of the tumour is smooth, not nodular, and it often varies in size from time to time and may be lessened by pressure.

INDICATIONS FOR OPERATION.

In most cases surgical intervention is inadvisable owing to the bilateral nature of the condition. In exceptional instances some conservative surgical procedure is called for : nephrotomy or puncture of the cysts. The circumstances which may call for this are : violent or continuous pain in the loin making life a misery, suppuration in the kidney, copious hæmaturia, and sometimes pressure on neighbouring organs from the large size of the tumour. If anuria supervenes it forms an absolute indication for operation with a view to relieving tension.

Prognosis.—*Risks of operation.*—Of twenty-five cases collected by Mohr, seven died in connection with the operation, so that the operative mortality appears to be high.

Results of operation.—In many cases anuria, severe hæmaturia, and suppuration have been successfully dealt with by operation. In unilateral cases the removal of one kidney has been successfully performed many times, but in most, cystic degeneration of the other organ has followed after a varying period. It must be remembered that cystic kidneys which are apparently in an advanced state of degeneration are often functionally active.

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HYDATID CYST OF THE KIDNEY.

Etiology.—Hydatid cysts are most frequent between the ages of 20 and 30, and in the male sex. They occur less commonly in the kidney than either the liver or the lung; in Neisser's 900 cases there were 80 examples, in the 970 cases collected by Vegas and Cramwell only 20.

Pathological Anatomy.—One kidney alone is affected in almost all cases, and the cyst develops in the cortex of the upper or lower poles. It may attain large dimensions and causes pressure atrophy of the surrounding renal parenchyma; but even in the case of very large cysts part of the kidney substance always remains and retains functional capacity. A cyst may calcify and atrophy, or may suppurate. The latter complication may produce serious symptoms, and the suppurating cyst may perforate into the renal pelvis, the pleura, or on to the surface in the loin. Rupture into the renal pelvis is common with or without suppuration (48 out of 67 cases).

Clinical Course.—Small cysts are often present without giving rise to any symptoms. The large cysts are to be felt as tumours in the renal region; sometimes they appear solid, in other cases fluctuation can be made out. Pressure on the tumour is usually painless. Sometimes there are subjective pains, and if vesicles are discharged into the renal pelvis and block the ureter, distinct attacks of colic result.

The urine may be clear, or turbid from an associated pyelitis, or it may be mixed with cyst contents. In the latter case it is turbid and more or less milky, or may contain blood or pus. Such an alteration in the urine is usually preceded by pain of a colicky character. The microscope will show the presence of scolices and fragments of membrane,

and occasionally whole vesicles are discharged. It is not, however, in every case that such direct evidence is obtained in the urine; a kidney may contain hundreds of vesicles and yet the urine may show no characteristic deposit. If infection takes place in a cyst, high fever and other signs of septic absorption supervene. A cyst may rupture and discharge vesicles into a neighbouring hollow organ.

Diagnosis.—Hydatid cyst of the kidney will be diagnosed when an elastic rounded tumour is found connected with the kidney, associated with the discharge of vesicles, hooklets, or fragments of membrane in the urine, or when exploratory puncture yields a clear fluid, poor in albumin, rich in chloride of sodium, and containing succinic acid. The diagnosis becomes certain if the tumour subsides simultaneously with the discharge of vesicles.

Hydatid cyst is not infrequently mistaken for hydronephrosis and solid tumours, and the diagnosis may be impossible if an exploratory puncture cannot be made and no hooklets are discharged in the urine. Regarding the diagnosis of renal swellings in general, reference should be made to the article on tumours of the kidney.

Renal hydatid may simulate ovarian cystoma; it is to be distinguished by its comparative immobility, and by the situation of the bowel in front of and to its inner side; rectal and vaginal examination will also aid in the differentiation. In the case of a patient under my care, a diagnosis of ovarian cyst had been made by several gynæcologists; I saw her only after several years' illness and when she was *in extremis*; the urine was turbid and milky, and hydatid membrane was found in it. The autopsy showed the presence of a hydatid ruptured into the renal pelvis, the kidney being much displaced downwards.

The unilateral character of the condition is sufficient, as a rule, to distinguish it from cystic kidney.

INDICATIONS FOR OPERATION.

If the diagnosis is certain, operation should be undertaken without delay if the general condition admits of it. If the diagnosis is uncertain, but an elastic swelling exists in the renal region, an exploratory operation is justified, particularly if fever points to the possibility of suppuration in the cyst, or a rapid increase in size of the tumour is noted.

The operation usually practised is incision, with suture of the cyst wall to the parietes.

Contra-indications.—Considering the dangerous nature of the disease, and the relatively slight risks attached to operation, there cannot be said to be any contra-indications.

Prognosis.—*Risks and results of operation.*—Since incision has become the practice rather than removal, the risk of the operation is slight relatively to the serious nature of the disease. Of twenty-three cases treated by incision one died, the cause being heart failure. In one of these cases secondary nephrectomy was necessary; the remainder recovered completely without further intervention.

Without operation.—The risks attached to suppuration are always imminent. Spontaneous recovery after discharge into the urinary channels is not very infrequent, but not sufficiently common that it can be relied on.

Reflex anuria may be induced in both kidneys if one ureter is blocked by vesicles. External rupture of the cyst may give rise to serious complications. On the other hand it must be noted that hydatid cyst of the kidney may be present for years without actually endangering life, and that escape of vesicles through the urinary channels not infrequently results in spontaneous recovery.

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HYDRONEPHROSIS AND PYONEPHROSIS.

Etiology.—Hydronephrosis may occur as a congenital affection, or may be acquired after birth. Congenital hydronephrosis is due to some malformation or to intra-

uterine chronic inflammatory processes, with consequent atresia of the urinary passages. Acquired hydronephrosis may be due to obstruction to the urinary flow either by some mechanical cause (tumour, calculus, foreign body), or by adhesions to surrounding structures and kinking of the ureter, or by swelling of the mucous membrane in the narrower portions of this channel. Pregnancy and a floating kidney are both predisposing causes to the condition. In order that marked hydronephrosis may occur it is usually the rule that the obstruction should be of gradual development or intermittent (Cohnheim).

An infection in some part of the body may secondarily cause infection of a hydronephrosis by way of the blood stream. Pyonephrosis is often, however, secondary to an infection in the urinary passages below, for example, cystitis, infection by catheterization, ulcerating tumours of the prostate and bladder, etc. Hydronephrosis is relatively common in childhood; pyonephrosis is rarely found before puberty.

Pathological Anatomy.—The terms *hydronephrosis* and *uronephrosis* Israël applies to the conditions of retention, which, resulting from some antecedent obstruction to the urinary flow, are at first aseptic but may later become infected. The term *pyonephrosis* he applies to a condition arising in direct connection with an infective inflammatory process without antecedent aseptic retention, the inflammatory process either from the commencement or subsequently causing the retention. Hydronephrosis may be unilateral or bilateral, open or closed. If the condition is advanced, the altered organ presents as a large ovoid elastic tumour, with contents either clear or turbid. The remains of the kidney substance is set laterally on the ovoid sac; the interior often presents several sacculations.

The most frequent causes of acquired hydronephrosis are changes in position of the kidney, renal calculi, tumours of the pelvis (especially uterine), compression of the ureters, and inflammatory swelling of the mucous membrane of the ureter. In a pus kidney due to infection of a hydronephrosis, the ureter is thin-walled and usually lengthened and in part distended, but when the condition is due to a primary ascending infection the ureter is shortened, thick-walled, and often shows circumscribed stenoses. When secondary

to hydronephrosis the tumour is often very large and unilocular; when due to primary infection it usually only reaches moderate dimensions and is multilocular.

Perinephritic suppuration often takes place without there being any actual communication between the perirenal abscess and the interior of the sac.

Clinical Course.—Hydronephrosis often develops without giving rise to symptoms. The most important sign is a tumour recognized as involving the kidney. Bimanually the tumour is well defined and as a rule not tender to pressure; fluctuation can as a rule be made out, but not always. There is usually a tympanitic note on percussion in front. The size may vary extraordinarily from time to time; the kidney may be mobile or immobile. Rapid diminution is associated with evacuation of large quantities of urine; while occlusion persists there is usually oliguria. The evacuated urine is sometimes clear; sometimes, although large in amount, it is turbid from admixture with mucus, pus, or blood. Sometimes casts or concretions are present. Persistent polyuria is less common.

The enlarged kidney often causes visible bulging in the loin; but if the organ is mobile the bulging will be in the lower part of the abdomen; even when hydronephrosis is bilateral, one side is usually larger than the other. Mobility on respiration is almost always present, though it may be only slight. As a rule the patient complains of a sense of fullness, but severe spontaneous pain is relatively uncommon; when present it is usually of a colicky character, resembling the pain of calculus. If it occurs in this form the affected kidney is usually also tender to pressure, and reflex inhibition of the secretion of the other kidney may occur. Sometimes when a hydronephrosis develops rapidly it is associated with fever; fever is usual in pyonephrosis, and may be intermittent, continuous, or remittent. Hæmorrhage may occur into the sac during the stage of occlusion, so that the urine which comes away after the attack may be hæmorrhagic.

In intermittent hydronephrosis there is a periodicity about the attacks of pain and the enlargement; once the occlusion has become permanent the pain often disappears. Uræmia develops if the function of the other kidney fails. Occasionally a hydronephrotic sac ruptures, either in

consequence of extreme distension, or some trauma; if this takes place there is great pain and collapse.

Cardiac hypertrophy is only occasionally present.

DIAGNOSIS.—If a cystic tumour is present in the renal region, and there is tympanitic bowel in front of it, if cystoscopy shows that no urine is coming from one ureter, and no other condition is present to account for this, the tumour is probably a hydronephrosis. Absence of a tympanitic note in front of the swelling does not exclude hydronephrosis; under such circumstances artificial distension of the stomach and colon may be of assistance. A tympanitic area will be present between the tumour and the liver or spleen, as the case may be. If the tumour diminishes either spontaneously or under palpation, and the fluid empties into the bladder, the diagnosis is practically certain. Exploratory puncture is risky, and does not give any decisive evidence.

If intermittent fever has been present for some time, and if the patient passes pus in considerable quantities from time to time, pyonephrosis must be diagnosed.

Differentiation from other cystic tumours, particularly of the kidney, is often very difficult. Ovarian cysts have attachments with the uterus and grow upwards from the pelvis. Other cystic renal tumours may be differentiated by catheterization of the ureter. In hydatid cyst scolices are often present in the urine. In hepatic and splenic tumours the dullness is continuous with that of the liver and the spleen. A hydronephrosis may move freely with respiration. In one of my cases the free mobility on respiration seemed to point to a splenic tumour, until pyuria cleared up the diagnosis.

Diagnosis from calculous kidney may be far from easy. In both conditions there may be attacks of colic; in hydronephrosis the tumour rapidly increases in volume during the occlusion stage, and red blood-cells are absent in the intervals of the attacks of colic, whereas they occur in stone cases after exercise.

A distended gall-bladder can usually be distinguished from a hydronephrosis if the patient is placed in the left lateral position; in this position the gall-bladder passes towards the left away from the kidney.

INDICATIONS FOR OPERATION.

If pyonephrosis is diagnosed operation is indicated without delay. Nephrectomy is usually necessary, more rarely nephrotomy.

For diagnostic, and above all for palliative purposes, puncture of a hydronephrosis may be indicated. When sudden occlusion gives rise to a large hydronephrosis, with much pain, oliguria, and other serious symptoms, if a more radical operation is not permissible, puncture with drainage is the best plan.

In cases of hydronephrosis without such acute symptoms, operation is called for when there is persistent long-continued pain, when non-surgical treatment of the cause (e.g., bandaging in floating kidney, reposition of uterine displacement) proves useless or cannot be carried out for some reason, and when the sac cannot be completely emptied by massage.

Torsion of the pedicle of a hydronephrosis or rupture call for immediate intervention. In occlusion with reflex anuria or oliguria, intervention is equally justified, since continuous catheterization of the ureter is dangerous.

Operation will be designed to deal with the cause of the retention, and the kidney will be extirpated only if it is very large, if the parenchyma is atrophied, if the ureter is obliterated, if the cause is an inoperable tumour situated in the pelvis, and if conservative methods prove useless. Nephrectomy is of course only justifiable when one is certain that a second and functioning organ is present. To be sure of this it is necessary to obtain the urine from each side. If only one organ is secreting, i.e., that on the apparently healthy side, it is necessary to examine its molecular concentration and the amount of urea. The phloridzin test is also of importance; 5 mgr. of phloridzin are injected subcutaneously, and the amount of sugar secreted is measured. The less the functional capacity of the kidney, the less urea is excreted, and the less sugar is passed after phloridzin injection.

External circumstances, such as the patient's position, may contra-indicate conservative methods, and point to the advisability of radical operation.

Contra-indications.—Against operation will be hydro-

nephrosis of both kidneys, the presence of some pernicious inoperable causative disease, such as uterine cancer, defective functional capacity of the second kidney, or the complete absence thereof.

In bilateral primary pyonephrosis any serious operative interference is, as a rule, contra-indicated.

PROGNOSIS.—*Without operation.*—There is often insupportable pain, sensations of distension, and frequent renal hæmorrhage. In the case of large tumours there is the risk of rupture; in hydronephrosis of a floating kidney the pedicle may become twisted. There is always the risk of a secondary infection in a case of hydronephrosis. Pyonephrosis may prove fatal from septic intoxication, or from spread of the inflammatory condition to other structures around.

Risks of operation.—Of forty cases of aseptic and infected hydronephrosis operated on by Israël, five died, three of these after primary nephrectomy. The operative mortality of pyonephrosis is still higher: a third of Israël's cases succumbed. According to this surgeon this is to be explained by the frequency of bilateral infection, by the small resistance of the primarily infected kidney to the infection, by the failure of compensatory hypertrophy of the other kidney, and finally by the fact that pyonephrosis is most common at a relatively advanced age (the ages of half of his cases lay between 50 and 70).

Results of operation.—Of Israël's 40 cases, 32 were entirely cured by operation, 3 relieved. In 19 cases of true primary pyonephrosis, the same surgeon obtained a complete cure in 58·8 per cent of those treated by primary or secondary nephrectomy, in only 5·2 per cent when conservative methods were employed. In many cases treated by conservative methods, particularly by incision for pyonephrosis, a urinary fistula persisted which necessitated nephrectomy later.

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TUBERCULOSIS OF THE KIDNEY.

Etiology.—Tuberculosis of the kidney may arise from infection by way of the blood stream, or from the urinary channels below. Sometimes the kidney is the only organ in the body showing tubercular infection; that is to say, primary renal tuberculosis occurs. The acute form of the disease is most common in children, the ascending form of chronic tubercle in men between twenty and forty, the primary disease in women. Tubercular foci in some part of the male sexual organs is not uncommonly an antecedent of a secondary renal invasion.

Pathological Anatomy.—There are two chief anatomical types, the acute disseminated and the chronic. The chronic type is often unilateral in the early stages, affects the left kidney more frequently than the right, and not uncommonly finds its seat towards the lower pole.* Fairly large caseous foci are produced in this way which tend to break down. In advanced stages the greater part of the renal parenchyma is often destroyed; the kidney is then enlarged as a whole. The renal pelvis and ureter are frequently invaded, and as the disease extends downwards the bladder becomes involved, in the first place round about the ureteral orifices. Israël records secondary bladder tuberculosis in 40 per cent of his cases. The disease may spread through the renal capsule and involve neighbouring structures.

It is a fact of great practical importance that unilateral primary tuberculosis does occur without any other discoverable tubercular lesion in the body.

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* Israël speaks of three types of the chronic disease: (1) The most common — the caseous-excavating type from which pyonephrosis may develop by mixed infection; (2) Tubercular ulceration of the apices of the papillæ; (3) The chronic disseminated nodular type.

In other cases autopsy has shown the bladder disease to be of old standing and extensive, the ureteral and renal infection being recent and at an early stage.

Clinical Course.—The disease often remains latent for a long period. The symptoms of chronic renal tuberculosis are general and local. Sometimes the general symptoms make their appearance before the local: loss of appetite and power of digestion, increasing anæmia, wasting, hectic fever (especially if the bladder is involved), and profuse sweating. As a rule other localizing symptoms co-exist with these: disturbances of micturition and changes in the composition of the urine. The patient passes water more frequently than usual, and sometimes complains of tenesmus or uncomfortable sensations after the act. Blood and pus are usually present in the urine, and not infrequently mucopurulent masses and shreds; the reaction remains acid. Hæmaturia is often the first symptom, and supervenes independently of exercise or exertion. Tubercle bacilli are to be demonstrated in the urinary sediment in about a third of the cases only. Casts are not common, and albumin is usually present only in small quantities. There is as a rule a complaint of pain, either constant or intermittent; it may be confined to the loin or may radiate towards the bladder and the thigh. Sometimes it is of a colicky character. Severe pain during micturition is almost entirely confined to cases where the tuberculosis has invaded the ureter and bladder.

The affected kidney can usually be palpated and its enlargement noted (19 times in 24 of Israël's cases), particularly if the surrounding tissues are involved in the inflammatory changes or if a hydronephrosis is associated with the tubercular lesion. Tenderness on palpation is slight unless there is acute suppurative perinephritis.

The duration of the disease is seldom more than five years from the appearance of the first symptoms until death. The propagation of the disease from kidney to bladder may occur at any stage of the disease.

Diagnosis.—The discovery of tubercle bacilli in the urine (to be distinguished from the smegma bacillus), may make the diagnosis certain; but even without this a definite diagnosis can usually be made.

If a unilateral renal disease is present, and the cystoscope shows evidence of tuberculosis limited to the ureteral papilla

or its immediate neighbourhood, it is clear that the disease is descending. Any purulent renal affection should raise a suspicion of tubercle; according to Israël a third of all pus-forming processes in the kidney are tubercular in nature.

In all cases of rebellious cystitis also, tubercle should be suspected; an evening rise of temperature, night sweats, tubercular lesions elsewhere, especially in the genitals, pallor, loss of appetite, renal pain, occasional hæmaturia and colic are sufficient to make the diagnosis clear, even if no tubercle bacilli can be found.

If, after an injection of tuberculin ($\frac{1}{2}$–1 mgram of the old tuberculin), there is pain in the kidney, hæmaturia, and tubercle bacilli in the urine, the diagnosis is also established.

The condition of the other kidney.—Before deciding on operation it is most important to have precise information about the other kidney. If urine is obtained from this side, and more than traces of albumin are found in it, it may be concluded that it is affected in some manner. A large quantity of albumin indicates a grave renal lesion if the heart is sound; a small quantity, however, does not necessarily mean a slight lesion. A lesion in this kidney may be actual tuberculosis, or waxy disease, or some accidentally associated condition, such as stone, or there may be simply a toxic nephritis of a relatively benign type, subsiding rapidly when the other—the tubercular—organ is removed. If tubercle bacilli are found in the urine from this side it will of course point to an actual tuberculosis here also; leucocytes, casts, and other pathological elements will not show whether the condition is actually tuberculous or waxy, or merely a toxic nephritis, and neither will cryoscopy and the phloridzin test give any absolutely reliable information on this point. These difficulties must be taken into account when the question of surgical treatment comes to be decided.

Differential diagnosis.—The diagnosis from an infected nephrolithiasis is specially important. The history of the passage of gravel or calculi previously, repeated colic, absence of tubercular lesions in other organs, and of tubercle bacilli in the urine, and examination with the X-rays, are usually sufficient to demonstrate the presence of calculus. Pyuria is not a common sign in new growths, and sometimes fragments of growth are to be found in the urine. If the

alterations in the urine and in the act of micturition are very pronounced it is sometimes difficult to distinguish tubercle from pyelitis. If, however, fever is constantly present, if the kidney is not particularly tender to pressure, and if the urine is only slightly turbid, tuberculosis is the more probable. The tuberculin reaction is also available as a means of differentiation, as has already been remarked.

In a female patient under my care, with tuberculosis of the bladder, an acute hæmorrhagic nephritis supervened and gave rise to a suspicion of renal tuberculosis; the presence of numerous casts, however, were against a chronic tuberculosis, and the autopsy showed that the kidney was free from tuberculous infection.

INDICATIONS FOR OPERATION.

Surgical treatment consists for the most part of total or partial nephrectomy. The evacuation of confined pus and broken-down tissue by nephrotomy is more rarely indicated. The indications for operation vary somewhat according to the stage of the disease. If one is fortunate enough to be able to diagnose a unilateral renal tuberculosis in the early stages, it is justifiable to institute a general expectant treatment if the surroundings of the case are favourable, and no severe general or local symptoms are present. If serious symptoms supervene, surgery must be resorted to, and it is in this way, rather the complications of the disease than the disease itself, which make operation urgent. Colic, fever, hæmorrhages, pyuria, retention processes, vesical pains, loss of flesh and appetite: these are the signs which call for intervention. If cystoscopy shows the disease extending to the ureteral papilla, nephrectomy is definitely indicated. The same is true when a primary renal tuberculosis is recognized, already well advanced and associated with fever, loss of flesh, anæmia, and night sweats, and the disease appears to be probably confined to one side.

A primary, unilateral, renal tuberculosis should also be operated on, even if the vesical mucous membrane is extensively involved. If a perinephritic tubercular abscess is present which has originated from the kidney, it must be opened and nephrotomy performed. If the disease is of the ascending type, operation is only indicated, according to Israël, when the renal disease gives rise to special and

severe symptoms, or when the retention of pus, fever, anæmia, and disorders of nutrition are breaking down the patient's powers of resistance.

Contra-indications.—Serious complications in other organs, and particularly serious tubercular lesions in lungs, bones, and glands, contra-indicate surgical intervention, as does also any well-established disease in the other kidney. It has already been remarked, that it is impossible to be certain whether disease in the other kidney is of a slight (toxic) or of a severe type in cases where the urine from this side contains little albumin and no tubercle bacilli; but if this urine contains much albumin, or renal elements in quantity, or pus, or tubercle bacilli, operation is correspondingly inadvisable. On the other hand, a slight amount of albumin and scanty renal elements does not contra-indicate operation when the disease on the other side is pronounced.

The methods of investigating renal function by cryoscopy and the phloridzin test do not give such certain results that they should be considered indispensable in deciding the question (Israël). Secondary tuberculosis of the bladder, unless advanced, is no contra-indication to nephrectomy, as experience has shown that this usually improves after removal of the kidney.

When, however, a primary bladder tuberculosis is associated with advanced disease in one kidney, and the other is not entirely healthy, even when the albumin from the latter is small in quantity, operation is not advisable, because primary bladder tuberculosis is usually followed by tuberculosis of the kidney on both sides.

Prognosis.—*Risks and results of operation.*—Israël has recorded 22 cases of primary renal tuberculosis (8 with secondary disease in the bladder); 16 were permanently cured by operation, and four died either immediately after or later. Of 8 cases of secondary renal tuberculosis or combined renal and vesical disease in which the primary seat was unknown, 3 were cured and 5 died. The same surgeon estimates the mortality of nephrectomy for tuberculosis at 28·5 per cent. The risk of the operation is therefore considerable. If the operation is successful recovery may be complete; cases are on record of perfect health eight years later. A toxic nephritis of the opposite kidney may also disappear

completely after removal of the tuberculous organ. Even vesical tuberculosis may disappear after nephrectomy, if not advanced.

Without operation.—Spontaneous recovery is exceptional, and occurs only when the disease focus is of small dimensions. Once the disease has given rise to symptoms it progresses, unless the kidney is removed, and slowly but surely leads to marasmus and death.

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PYELITIS AND SUPPURATIVE NEPHRITIS.

Etiology.—Suppurative renal affections are more frequently met with in adults than in children, and in men than in women. Pyelitis is often caused by the presence of some foreign body in particular calculi, more rarely new growths and parasites; it also occurs from ascending infection from the bladder, and also from the action of irritant diuretics. Venous engorgement, injury, and adjacent inflammatory lesions (either in the renal parenchyma or the surrounding tissues) are all of etiological importance. Suppurative nephritis also occurs by metastasis from some septic focus elsewhere in the body, and supervenes sometimes in the course of certain of the acute exanthemata: variola, scarlatina, and typhoid.

Pathological Anatomy.—Suppurative nephritis may

be secondary to infection conveyed upwards from the urinary passages or conveyed by the blood stream, or it may result from an inflammatory affection of neighbouring structures or a penetrating wound. In hæmatogenous infection the original focus is often in the lower urinary passages, or may be in some distant part of the body. The disease is more frequently unilateral than bilateral, not only when calculus is the cause, but also in ascending infections.

Acute catarrhal, chronic catarrhal, purulent and ulcerative forms are recognized, the ulceration in the last being often very destructive. If the escape of the urine is prevented in a case of pyelitis, the condition becomes one of pyonephrosis. The inflammatory condition of the pelvis often extends to the parenchyma, and abscesses develop frequently in large numbers.

A purulent pyelonephritis may be the precursor of perinephritic abscess. When a renal abscess develops from blood infection, the secondary involvement of the renal pelvis, if it occurs, is usually not of a pronounced character. Abscesses originating in this way may be multiple; by confluence, cavities of considerable size may develop, and tend to make their way through the capsule. Such abscesses are often entirely shut off from the renal pelvis and urinary passages.

Clinical Course.—In cases of *pyelitis* the urine is turbid, often purulent, and sometimes bloody. If the renal parenchyma is not involved the amount of albumin is small; n *pyelonephritis*, on the other hand, both albumin and casts are present in the urine. If discharge from the kidney is obstructed the urine may be quite clear, coming from the opposite kidney alone; in such a case the diseased organ will be enlarged, painful, and tender to pressure, signs which subside if the obstruction disappears, and the urine again becomes turbid.

In acute pyelitis the amount of urine is often diminished, and sometimes there is marked tenesmus; even in cases where the opposite kidney is sound, reflex anuria may develop. In *renal abscesses following blood infection* the amount of urine is often lessened, and albumin and renal elements are present in quantity. In such a case pyuria occurs when the abscess ruptures into the renal pelvis, and the fever and pain then often subside simultaneously. If a

parenchymatous inflammation is associated with pyelitis, casts of various kinds will be present in the deposit. If, however, an abscess is encapsuled in the kidney substance the urine may be normal in every respect.

Pains, sometimes of a distinct colicky character, are frequent in acute pyelitis ; in the chronic disease they are only present when some obstruction occurs to the emptying of the renal pelvis. In acute purulent nephritis, pain and tenderness on palpation are usually very acute, and the same is true of traumatic suppurative nephritis. In the latter, hæmaturia and rigors are common, and sometimes reflex anuria. Fever is the rule in acute pyelitis, and occurs in the chronic disease when there is absorption of the infective products. A palpable tumour is to be felt in pyelonephritis only when retention occurs.

In acute renal abscess fever is often high and sustained ; in the subacute and chronic abscess it is often present in an intermittent form, with rigors and sweating, but is sometimes absent altogether. In acute abscess the patient usually loses strength rapidly, and enlargement is commonly to be made out, as well as tenderness.

When an ascending inflammation invades the kidney the amount of urine is diminished and the amount of pus increased. The opposite kidney is often affected with a toxic nephritis or with amyloid disease in the chronic cases.

Diagnosis.—Pyelitis will be diagnosed when pus is present in the urine but there is no disturbance of micturition, when there are no casts and only traces of albumin, when one of the kidneys can be felt as a tender swelling in the loin, and when, after washing out the bladder, purulent urine is withdrawn by catheter after pressure on the swelling.

The diagnosis is established if the cystoscope shows pus coming from one ureter, whether the bladder is healthy or not. If the signs point to pyelitis, and at the same time there are numerous casts and much albumin in the urine, the diagnosis will be pyelonephritis.

Hæmatogenous renal abscess with subsequent rupture into the renal pelvis is usually to be recognized from the presence of some infective focus, an acute commencement with rigor, high fever, local swelling and tenderness, and the sudden appearance of pus and often blood and renal elements

in the urine. The enlargement of the kidney is the sign of most importance.

The conditions which may be confused with a pyelitis are tumours of kidney, liver, spleen, ovary, and intestine. Repeated bimanual examination is of special value, under anæsthesia if necessary. If the intestine is inflated a renal swelling is found to be behind the colon, and below and behind an inflated stomach. Pelvic examination will exclude ovarian tumours. Inflation of the colon will show up a liver or splenic tumour. If the tumour subsides coincidently with the appearance of pus in the urine, this will aid the diagnosis. If there is a fistula in the loin, and methylene blue is injected into this, it will be seen within a minute issuing from the ureter. Pus with a urinous odour may be found with an exploring syringe, but such an exploration must not be done unless preparations are made to operate at once.

INDICATIONS FOR OPERATION.

The discharge of pus from one kidney is an indication for operation, whether the suppuration is the consequence of an ascending infection, a direct renal trauma, the spread of an inflammatory condition from surrounding structures, or a blood-borne infection. High-fever, rigors and sweating, and other acute signs indicate the necessity for immediate intervention, even in cases where the inflammatory condition is chiefly but not exclusively unilateral. In every case it is necessary to ascertain whether there are two ureters opening into the bladder, and which is the one discharging urine; also as much as possible about the functional capacity of the healthy or comparatively healthy organ. Without information of this kind nephrectomy cannot be performed.

Contra-indications.—In a hæmatogenous suppurative affection of the kidney associated with multiple foci elsewhere, operation is inadvisable, particularly when the causal condition cannot be treated (ulcerative endocarditis); bilateral renal suppuration is not in itself a contra-indication. Other serious complicating affections also contra-indicate intervention. As a rule the demonstration of a severe bilateral pyelitis secondary to bladder disease is a deterrent to operation. If cysto-pyelonephritis supervenes in the

course of some central nervous disease (tabes), any surgical intervention will also be entirely unsatisfactory.

PROGNOSIS.—*Results of operation.*—Suppurative renal affections are often cured by nephrotomy. In many cases of small multiple abscesses, recovery has been obtained by splitting the kidney or resection of the affected portion (Rovsing). Even in the ascending infections, with suppuration of the kidney, operation often produces marked amelioration and cure.

Risks of operation.—If one kidney is removed and the other is defective in functional capacity, a fatal uræmia is to be expected. Patients who have been much weakened by long suppuration are very susceptible to the risks of general anæsthesia.

Without operation.—A suppurative renal affection may be the starting-point of a general septicæmia. Chronic disease tends to produce waxy changes in other organs. Sometimes the pus evacuates itself through the renal pelvis. The rupture of abscesses is signalized by a sudden pyuria and the subsidence of fever, pain, and the general symptoms.

In two cases recently under observation, the following was the course of events. Both were about to be submitted to operation, and the only delay was the necessity for completing the clinical examination. After the onset of pyuria, the fever, tenderness, and leucocytosis disappeared. In both there was a short recurrence of symptoms, terminating in the same manner as before, and then complete recovery followed. In neither was the original seat of infection discovered. Such a happy course of events is not, however, usual; the suppurative focus usually extends to the whole organ, and then ruptures through the capsule, and may reach the exterior. A fistula thus established continues to discharge and shows no tendency to heal, and waxy disease or some secondary wound infection may result. In some cases the pus makes its way into the bowel or some other organ.

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PERINEPHRITIS.

Etiology.—Perinephritis is sometimes secondary to lumbar injuries ; it is often due to extension from neighbouring structures, and in this way it may follow renal abscess, pyelitis, pyelonephritis, pelvic abscess, vertebral disease, and abscesses of the liver and spleen. It may occur as a metastatic process in pyæmia.

It is especially common about middle life, and in men.

Pathological Anatomy.—The condition is usually unilateral. Israël distinguishes three chief forms : (1) The fibrosclerotic ; (2) The lipomatous ; (3) The phlegmonous. The fibrosclerotic form transforms the fatty capsule into a dense fibrous mass. In the lipomatous there is sometimes a very pronounced overgrowth of fat surrounding the whole kidney. The phlegmonous type originates either in the fatty capsule itself, or by extension from a neighbouring suppurative focus, or as a metastatic infection.

In many of the cases where the perinephritis apparently originates in the fatty capsule, the real starting-point is a small abscess of the kidney ; of 43 cases operated on by Israël, 34 originated in this way.

The phlegmonous inflammation may start as a subcapsular process, or in the fatty capsule, or in the retroperitoneal fatty tissue. Most frequently the purulent

collection forms behind the kidney; it tends to spread upwards through the diaphragm to the subpleural tissue, and may rupture into a bronchus. In other cases the pus makes its way downwards to the thigh, or becomes superficial in the lumbar region, or may discharge into the bowel.

Clinical Course.—The commencement of the affection is often associated with general symptoms only—fever, exhaustion, and rigors; local symptoms either succeed these or may appear at the same time. Pain is localized in the loin, and is exaggerated by deep inspiration, by pressure, and by active movement; it may be absent during the earliest stages. I have found hyperæsthesia in several cases over the area supplied by the ileohypogastric nerve, and sometimes there is distinct cutaneous hyperæsthesia in the loin. Meteorism is often present, and the respiratory movements are usually shallow.

Sometimes the onset is characterized by vomiting and urinary tenesmus, and renal elements are found in the urine, which owe their presence to the nephritis, to which the perinephritis is secondary.

Sometimes in the early stages the hip on the affected side is kept flexed, but it is only extension which is limited, the other movements remaining free. Pain may radiate down the sciatic nerve, and the lumbar spine may be kept rigid. The condition may be present for some considerable time before an actual lumbar swelling makes its appearance, but sooner or later this develops. A local œdema of the skin in the loin is a diagnostic point of much value. The swelling, although involving the kidney region, has not the well-defined shape of an enlarged kidney, its margin being irregular, it does not move with respiration, and it gradually increases in size. It may be possible to make out fluctuation. If left alone it comes to the surface and ruptures, or it may perforate into the bowel, the bladder, or some other organ. In other cases there is a tendency towards the diaphragm from the early stages, and the abscess becomes subphrenic, and may further make its way into the thorax and perforate into the pleura or the lung. In such cases a dry pleurisy often develops early. A radiograph may show the diaphragm pushed up on one side and comparatively immobile.

One of my cases was that of a young man who developed a dry pleurisy at the base of the right lung, with fever and rigors. The fever remained high in spite of the absence of exudation and any recognizable lung affection. Dull pains in the loin early gave rise to a suspicion of perinephritis, and a resistance developed here with an overlying inflammatory œdema. A large retrorenal abscess was opened, extending upwards to the diaphragm, and the man recovered. The pleurisy soon subsided after the operation.

Diagnosis.—If the cardinal symptoms—fever, pain, and swelling—are all present, the diagnosis is clear. The most instructive and important sign is the swelling, particularly if it extends along the course of the psoas, which a renal tumour does not. Extension and protrusion towards the loin, without any large palpable tumour, is characteristic of perinephritis, but not of renal tumour. Marked tenderness on pressure in the loin is characteristic of perinephritis ; in inflammatory swelling of the kidney the tenderness is more in front. Normal urine points to the absence of any other complicating renal disease. Against " lumbago " is the pyrexia and the unilateral nature of the complaint.

In tubercular abscess some tubercular bone lesion above, of vertebræ or rib, will be discoverable. An appendix abscess or an abscess originating in the genital organs has been mistaken for perinephritis. Extension towards the loin is not frequent in these conditions. In perinephritis there is no rigidity of the abdominal wall, and no resistance in the cæcal region.

INDICATIONS FOR OPERATION.

If there is only a definite suspicion of perinephritis, operation is necessary. Early diagnosis is of the greatest importance in order that early relief may be given. If fever is present, if there is a resistance in the loin and tenderness on pressure, and leucocytosis, the signs are sufficiently marked to warrant incision. Operation will be justified even when there is no definite resistance if there is an inflammatory œdema of the skin. If an exploratory puncture reveals pus, incision is of course called for.

There cannot be said to be any contra-indication unless there is some complication which makes the case hopeless.

Prognosis.—*Risks of operation.*—Since only a simple

incision is usually necessary, the operative risk is small. Sometimes the kidney is completely disorganized and has to be removed, and the risk is thereby increased. Suppuration of an undamaged kidney is only to be feared when some operative measure encroaching on the kidney (removal of a stone, for example) has to be associated with the opening of the abscess.

Results of operation.—Complete relief usually follows the evacuation of the pus, and the patient usually makes a rapid recovery.

Without operation.—It has already been remarked that the pus often makes its way into the thorax; according to Fischer, in 20 per cent of the unoperated cases the lung becomes involved; the pus may also come to the surface, or rupture into a hollow abdominal organ. Such extension to other organs may give rise to dangerous complications. Spontaneous recovery does sometimes occur in this way, but it will of course never be deliberately counted on. Even if the pus does not penetrate in this way, all the symptoms caused by retention of such collections in the body will tend to supervene, i.e., pyæmia and septicæmia, and a remediable may become an irremediable affection.

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CHAPTER XXIV.

Diseases of the Bladder.

Chapter XXIV.

DISEASES OF THE BLADDER.

CYSTITIS.

Etiology.—Cystitis is always caused by micro-organismal infection, which may be conveyed either by the urethra or from the kidney. In the latter case the process may be either directly descending, or the bladder may be infected by microbe-containing urine from an unaltered kidney. Finally the vesical mucous membrane may be infected through the blood stream, or by extension from some adjacent focus.

Associated causes are calculi, growths, and foreign bodies. Diseases of the central nervous system and of the prostate, pregnancy and labour, and senile changes are all predisposing causes.

Pathological Anatomy.—Superficial, parenchymatous, and ulcerative forms are distinguished, and the condition may be circumscribed or diffuse. In chronic cystitis the mucous membrane and muscular coats are hypertrophied, the wall is thus thickened, and prominent trabeculæ are formed.

Clinical Course.—The characteristic symptoms are, intense and frequent desire to pass water, and pain during the act. The bladder is sensitive, for example, on catheterization, and tender to pressure. Cystoscopic examination shows injection of the mucous membrane, which bleeds readily, and in some cases ulceration. The urine contains pus, sometimes blood, the reaction is often acid, but if there is retention of urine it is frequently alkaline and ammoniacal. The organisms most frequently found are staphylococci, streptococci, *B. proteus*, *B. coli*, and gonococci. An acute attack may be followed by chronic disease persisting for several years, with acute exacerbations. In other cases

the process rapidly extends to the upper urinary passages. If the inflammatory process spreads to the deeper layers of the wall, the bladder may become shrunken, and the patient in this condition will have an almost constant desire to pass water. In some cases a cystitis is followed by a perivesical cellulitis which may extend to the peritoneum, the perineum, or the perirectal connective tissue.

Diagnosis.—Painful micturition, tenesmus, and purulent urine are present in many renal affections (tuberculosis, infected calculous disease, etc.), as well as in cystitis, and some of the symptoms are present in inflammatory affections near the bladder. If the vesical symptoms undergo a sudden unexplained change, while the pyuria remains constant, some extravesical inflammation must be suspected. Careful examination of the kidneys and the urine, cystoscopy, and separation of the urine will show whether the symptoms are due to renal disease. Tenderness on catheterization, on pressure from the vagina or the rectum, point to a vesical rather than a renal affection. The two-glass test differentiates a vesical from a urethral suppuration.

INDICATIONS FOR OPERATION.

If strangury and painful contractions of the bladder persist in spite of persevering and energetic local treatment, and in spite of drainage by catheter and medicinal treatment, the organ must be placed at rest by incision and drainage. The fistula will be maintained only as a temporary measure, and will be allowed to heal when the cystitis begins to improve. If the changes in the mucous membrane show no improvement in spite of persistent local treatment, and the cystoscope shows fungous granulations or ulceration, these must be dealt with by the sharp spoon and by the cautery. The ulcerative and membranous form of the disease must be treated by cystotomy and local treatment when there is intense pain and hæmorrhage, and the membranous deposit does not clear up.

Contra-indications.—No operation should be done until a proper attempt has been made to cure the condition by lavage, internal medication, or drainage by catheter. Disease of the central nervous system is in general a contra-indication to operation; if improvement takes place, which is exceptional, recurrence soon follows.

PROGNOSIS.—*Results of operation.*—In many cases, after opening and draining the bladder, the pain and tenesmus improve greatly, and the urine also becomes clearer. Cauterization and scraping are procedures from which good results are often obtained.

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NOCTURNAL ENURESIS.

There are two chief types of this affection: (1) The symptomatic type, due to some pathological lesion of a local nature, or of the spinal cord or brain; (2) Essential enuresis without changes in the urogenital apparatus, the central nervous system, or the urine. The latter type alone will be here considered; it is of the nature of a neurosis. It is sometimes due to psychic abnormalities; in other cases it is ascribable to diseases of nutrition, scrofula, anæmia, and the uratic diathesis. In many cases some local affection appears to be the cause; thus it occurs in vesical calculus, stricture of the urethra, phimosis, atony of the sphincter. Occasionally there is an hereditary predisposition. It is more common in boys than girls, and usually disappears in all cases before the age of fourteen.

SYMPTOMS.—The enuresis occurs usually in deep sleep after the child has been some hours in bed, and the urine is usually passed in considerable quantities. The child does not necessarily wake. Not uncommonly there is some spasmodic contraction of the leg muscles, especially the adductors. Fæcal incontinence is unusual. Other neuroses, hysterical and neurasthenic symptoms, are often present.

INDICATIONS FOR OPERATION.

If all the recommended general and local methods of treatment prove ineffectual, if the enuresis is persistent

and frequent and is causing eczema, and if the child is some distance removed from the age when spontaneous cure is usual, intervention is justifiable. This will take the form of an epidural injection of cocaine, or saline solution ($\frac{1}{2}$ per cent), and will be made into the sacral canal. Cathelin has carried out this treatment on more than 1000 occasions, and Kappsammer on more than 300, and neither has to record any unfavourable results. Kappsammer records 25 cases which were followed up, all being cured of the affection ; Cathelin and Albarran also report recoveries and improvement.

When left alone the affection is very persistent. It may recur even after some months of freedom.

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TUBERCULOSIS OF THE BLADDER.

Etiology.—Vesical tuberculosis is usually secondary either to renal tuberculosis, or, in the male, to tuberculosis of the genital organs. Occasionally, however, it is found as the sole focus of the disease clinically discoverable. Gonorrhœal cystitis appears to predispose to the tubercular disease. It is much more common in males than in females, and among the poor than the well-to-do class.

Pathological Anatomy.—Circumscribed foci are often present ; these are most common about the ureteral orifices when the disease has descended from the kidney, and about the neck of the bladder when it has had its origin in the male genital organs. In other cases the whole mucous membrane is beset with nodules. When these caseate and break down,

superficial ulcers of considerable size develop, and on these ulcers incrustations are often formed. When the ulceration is extensive, the whole inner lining of the bladder is red, swollen, and hæmorrhagic. In some cases a purulent pericystitis occurs in consequence of the deep extension of the ulceration.

Clinical Course.—The first symptoms of bladder tubercle are increased frequency of micturition, intense desire to empty the bladder, and pain during the act. During the intervals the pain persists in the penis and the perineum. As the process of ulceration develops, spontaneous hæmorrhages occur; these are frequent, but rarely profuse, and are often among the early signs of the disease. Occasionally incontinence of urine sets in, and in some cases this is complete. Severe general symptoms—hectic fever and profuse night sweats—are common in the more advanced stages of the disease.

Usually a tubercular focus in some other organ can be discovered.

In the early stages the urine is acid, clear, or slightly turbid from pus. Later the amount of pus increases and blood is also present, but blood may also occur at an early stage. When the pyuria is well marked, the reaction is often alkaline. Palpation often demonstrates tenderness and contraction of the bladder wall.

Diagnosis.—The spontaneous occurrence of hæmaturia in young individuals who have never had gonorrhœa, and have never had an instrument in the bladder, is almost a pathognomonic sign of tuberculosis (Zuckerkandl), particularly if renal calculus can be excluded. The onset of cystitis, without apparent cause, in an individual with a tuberculous family history, or with tubercular lesions elsewhere, suggests vesical tuberculosis, and the discovery of tubercle bacilli in the urine and cystoscopic examination will settle the diagnosis. The presence of nodular masses in the prostate, seminal vesicles, vasa deferentia, or epididymes will point to tuberculosis. New growths will be excluded by the slightness and at the same time the persistence of the hæmaturia, and by the positive discovery of tubercle bacilli. Chronic cystitis has usually some definitely known cause, is improved by treatment, and does not tend to produce hæmaturia.

INDICATIONS FOR OPERATION.

There is no general rule for surgical interference, the advisability of operation depending frequently on the condition of the associated organs. If the bladder disease is secondary to a unilateral renal tuberculosis, the indication is to attack the disease in the kidney; the elimination of the renal disease is usually followed by healing of the bladder lesions. If the bladder disease is associated with genital lesions, the latter should be operated on first and the bladder later. If the bladder disease is clinically the primary lesion, if local therapeutics fail, and the pain and distress are great, operation is indicated. This will consist in eradication of the disease foci, with or without cystotomy, of excision in the case of solitary ulcers, or finally in resting the bladder by the establishment of a fistula.

Contra-indications.—If there is extensive genital tuberculosis, or bilateral renal tuberculosis, or advanced tubercular lesions elsewhere, operation on the bladder is useless. Cases in which the disease is florid and making rapid progress are unsuitable for operation.

PROGNOSIS.—*Results of operation.*—Operation often produces a rapid improvement in the subjective symptoms. After opening the bladder, the pain, distressing tenesmus, and hæmorrhage may all improve. In some cases cure has been obtained by direct eradication of the disease. In many cases there occurs, however, a local return, and in others other parts of the urogenital apparatus are attacked by the disease. If the tubercular products are not dealt with by operation, the extension of the disease tends to be the more rapid, and dangerous complications supervene the earlier.

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CHAPTER XXV.

Diseases of the Joints and Bones.

Chapter XXV.

DISEASES OF THE JOINTS AND BONES.

THE NERVOUS ARTHROPATHIES.

Etiology.—These affections occur in patients suffering from organic disease of the nervous system, especially tabes and syringomyelia. Trauma appears to play a considerable part in their causation.

Pathological Anatomy.—Investigation of specimens has shown that the changes in the joints are of similar character in the various nervous diseases in which these affections occur. From the appearances of a specimen alone it would be impossible to say whether the patient had suffered from tabes or syringomyelia. These joint changes assume two forms, the atrophic and the hypertrophic. In the former, the articular ends of the bones are gradually worn away, and even a considerable portion of the diaphysis may be absorbed if the patient continues to use his limbs; in a tabetic patient under my care, a fourth of the length of the femur disappeared in this way. The absorption of articular cartilage and bone, the exudation in the joint, and the relaxation of ligaments often permits very considerable dislocation to take place. In the hypertrophic form the joints are enlarged; the articular cartilage disappears, and its place is taken by exuberant newly-formed connective tissue. The synovial membrane is often distended and shows numerous ragged outgrowths, and there are often cartilaginous or osseous loose bodies in the joint. The joint capsule is much thickened, and there are often exostoses, and sometimes ossified muscles, around it. Sometimes the capsule gives way at one or more points. Occasionally the atrophic and hypertrophic forms are combined.

Clinical Course.—The affection often has a sudden onset, with enormous effusion into the joint, and sometimes marked swelling of the whole extremity. There is no fever. The effusion may remain stationary or be absorbed, to reappear after a time either spontaneously or following some slight trauma. After each effusion the joint changes become more advanced, and, as already remarked, they may be either atrophic or hypertrophic in character. In the former case the articular surfaces separate and the joint becomes flail; in the latter the joint becomes enormously enlarged and deformed. The thickening and distension of the capsule, the building up of new connective tissue, the formation of exostoses and intra-articular masses may reach extraordinary proportions. Spontaneous fracture of the bones near the joint frequently occurs. There is absence of pain throughout.

In tabes the joints of the lower limb are those usually affected: the knee and the hip; in syringomyelia, on the other hand, it is the joints of the arm that are usually involved: the shoulder, the elbow, and wrist. In tabes the affection is often bilateral; in syringomyelia, rarely so.

These joint changes may occur early in the course of the disease to which they are due. Serious complications may supervene; a local necrotic process may set in, involve the bones, and extend to the joint. A suppurative arthritis is thus set up. This may also occur as a metastatic process. It is usually attended by high fever and rigors. Sometimes a fistula forms communicating with the joint and discharging a serous fluid. The patients, as a rule, tolerate these septic processes surprisingly well.

With regard to differential diagnosis, arthritis deformans is the only condition with which there might be some confusion; the painful nature of this process is sufficient to distinguish it.

INDICATIONS FOR OPERATION.

Since these arthropathic lesions occur in the course of progressive nervous maladies, and often spontaneously retrocede, most surgeons have with good reason advised against operation when they run an uncomplicated course, and have confined treatment to the use of some orthopædic apparatus. Sometimes, however, even if no complication

is present, operation is advisable; if the effusion becomes excessive and persists for a long time, and if the sensation of distension is very troublesome, puncture followed by compression is indicated. The more extensive operations —resection and arthrodesis—are not called for on account of pain, but may be justified by other circumstances. If the limb has been rendered flail, and the patient is quite incapacitated from work thereby, operation is to be recommended, and when it is the upper limb that is affected, resection will be chosen. A further indication is provided when the lower limbs are affected, and the patient is unable to walk without help, or when his helplessness confines him to bed. If the articulation suppurates, operation must of course be done, also if the fluid makes its way to the surface and creates a fistula, or if there is bony necrosis and the sequestrum does not separate spontaneously. In all such cases the joint must be opened and resected or the limb amputated.

Contra-indications.—If the affection is present only in a moderately severe form, if it is recent and uncomplicated, and has not made the limb useless, no operation should be done. Severe complications and a bad general condition (waxy disease) are also contra-indications. One would hesitate also if the lesions were multiple and of a severe type.

Prognosis.—*Results and risks of operation.*—In uncomplicated cases the functional usefulness of a joint may be improved. I have seen this after resection of the shoulder in several cases of syringomyelitic arthropathy, and also in cases of tabes with advanced arthropathic deformity of the knee. The joint condition is not, however, curable by operation. If the indications already given are followed, no serious risk is attached to operation. If the joint suppurates or threatens to suppurate, operation may be directly life-saving.

When no operation is undertaken and the affection is complicated, death may take place from septicæmia or pyæmia, or, when a more chronic course is followed, from waxy disease of the internal organs.

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ARTHRITIS DEFORMANS.

Etiology.—Age, trauma, heredity, and anomalies of nutrition, all appear to exercise some causative influence.

Pathological Anatomy.—The disease gives rise on the one hand to erosion of the cartilages of the joint and eburnation of the bones, and on the other to osseous and cartilaginous proliferation, thickening of the capsule, and, at least temporarily, to considerable effusion. Following relaxation of the ligaments, luxation or subluxation is frequent, and is encouraged by the changes in contour which the joint undergoes. Not uncommonly hyperplastic fringes are present in the articulations, and these may become free and form loose bodies. The disease may be confined to one joint or be present in several.

Symptoms.—Pain on movement is present from the beginning, and increases. Movement gives rise to a grating sensation in the joint, and the functions of the latter are early interfered with. As the disease progresses the joint becomes swollen; sometimes it becomes softer, sometimes firmer to palpation. The changes can be demonstrated by radiograph at a relatively early period. The swelling increases, movement becomes more and more restricted, the joint surfaces correspond less accurately, and there is often considerable effusion. The skin over the joint becomes smooth and shiny; the bones remain normal in the neighbourhood of the joint.

Diagnosis.—This is based on the clinical characters. Nervous arthropathy is distinguished by its painlessness. In chronic rheumatism there is no deviation of the joint surfaces. Gonorrheal rheumatism produces fixation of the joint from an early stage. Tuberculosis is distinguished by the rounded and doughy character of the joint swelling.

INDICATIONS FOR OPERATION.

Operation is not often called for. It may take the form of the injection of some irritating fluid into the joint, or the removal of fringes and loose bodies, or resection. Resection is only practised when the disease is mono-articular (it is usually mono-articular when of traumatic origin); it is indicated when the pain is intolerable, when considerable deformity has taken place, and when the patient is becoming unfitted for work, and when he is still comparatively young.

Loose bodies and fringes should be removed when they are causing marked disability. When the effusion is large and persistent the joint should be punctured and washed out.

Contra-indications.—No operation should be done when the patient is old, when the process affects several joints, or when serious complications (e.g., diabetes) are present. Puncture should not be performed in the case of a recent effusion; this is frequently absorbed spontaneously.

PROGNOSIS.—*Results of operation.*—Pain is almost always relieved by operation, function is also frequently improved, but not often completely restored. Injection and washing out of the joint often has a good influence on the disease, and the exsection of fringes and loose bodies often removes disability.

The dangers of operation are slight when the usual precautions are taken and the indications which have been laid down are followed.

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OSTEOMALACIA.

ETIOLOGY.—Frequent pregnancies at short intervals, difficult labours with slow convalescence, predispose to the disease; malnutrition and unhealthy and damp surroundings also appear to favour its onset.

Pathological Anatomy.—Osteomalacia renders the bones soft and brittle. It may be described as a chronic ostitis, with decalcification and the formation here and there of masses of new bone tissue. The decalcification takes place from within outwards, and is not uniform. Usually there are multiple fractures, which do not consolidate; the deformity of the pelvis is characteristic.

Symptoms.—The first symptoms are usually pain in the pelvis and difficulty in movement. Contraction of the adductors prevents rapid abduction of the thighs. At an early stage there is tenderness on pressure over the ribs, sternum, long bones, and pelvis. When the ilia are forcibly and rapidly compressed there is a sensation of resiliency. The patient becomes shorter in stature, the gait becomes awkward and waddling, and she usually requires a stick or the support of a companion. Curvatures of the bones become marked; the pelvis acquires its characteristic beaked shape, the ribs almost touch the iliac crests, and the thorax is greatly deformed. Spontaneous fractures are common occurrences. The patellar reflexes are exaggerated.

At a later stage contractures occur throughout the muscular system, the skin atrophies, the muscles degenerate, and dyspnœa and cachexia supervene.

The disease usually makes its first appearance during pregnancy; labour takes place normally, and the patient improves; but if she become pregnant again the disease progresses rapidly, and succeeding pregnancies still further aggravate it.

Diagnosis.—The early tenderness of the bones, the contracture of the adductors, the waddling gait, and the loss of stature make the diagnosis certain. It may be confounded with certain spinal affections if its characteristics are not kept clearly in mind, and its symptoms may be in part simulated in cases of multiple myeloma and of pseudo-leucæmia. Multiple myeloma will be distinguished by the presence of albumosuria and swelling of the lymphatic glands and spleen, by the radiographic examination of the bone swellings, and the appearance of symptoms of spinal cord compression. In hysteria there are no bony deformities.

INDICATIONS FOR OPERATION.

Fehling has collected evidence to show that castration can cure osteomalacia. Internal treatment with phosphorus is also often successful, and therefore operation will only be recommended under certain conditions (Latzko). If the patient is not pregnant, castration should be done when internal treatment with phosphorus for six months or more has failed. In pregnancy the child should only be considered if medical treatment has succeeded so far as to check the symptoms; these are aggravated, as a rule, as pregnancy progresses, and when this is the case premature labour should be induced. When treatment with phosphorus fails during pregnancy and the pelvis is narrow, one should be content with procuring abortion, because treatment may be successful after this, and a living child born. If pregnancies rapidly follow each other, or if abortion is frequent, Porro's operation should be done, or total extirpation through the vagina. When the pelvis is extremely narrow, and abortion cannot for that reason be procured, Porro's operation should be done, with or without castration.

Contra-indications.—No operation will be done unless internal treatment has been tried. No success follows operative treatment in the virgin or the aged, and it will, therefore, be avoided. Occasionally the affection is associated with disease of the central nervous system (tabes, syringomyelia), and when this is the case, or when there is some other complication such as tuberculosis, no operation is advisable.

Prognosis.—*Risks of operation.*—These are not slight in any of the methods recommended. Sixty-nine cases of Porro's operation for osteomalacia published up to 1898 showed a mortality of nine. Death occurred from heart failure, bronchitis, bronchopneumonia, and sepsis.

Results of operation.—In many cases removal of the ovaries has permanently cured the disease; in a minority the condition has progressed in spite of it. Late recurrence has been observed in some cases. I have seen a case in which the symptoms advanced in spite of castration, and even the bones of the skull were affected; in another case recovery was complete. Pain is usually very rapidly relieved by operation, and, as a rule, entirely disappears by degrees.

First the pains in the bones of the trunk improve, and then those in the long bones. The deformities of course remain in spite of the recovery.

If no operation be undertaken internal treatment with phosphorus is often successful; untreated puerperal osteomalacia is fatal in 80 per cent of cases. Treatment with phosphorus can claim results equal to those of operation, and after an experience of many cases, I can endorse the opinion of Latzko that the prospects of success with this drug are very favourable; the pains diminish, the bones consolidate after some months of treatment, and finally the patient is able to get about again. In none of the cases which I have seen in virgins and in puerperal women has this treatment been without some measure of success; in senile osteomalacia the results are not so favourable. Those who advocate early operation for this condition should take note of these facts, especially in view of the comparative risks of the two methods*.

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* In one of my cases death occurred from subacute phosphorus poisoning; the patient had much exceeded the daily dose prescribed.

APPENDICES.

APPENDICES.

Appendix I.

INDICATIONS FOR THE INDUCTION OF PREMATURE LABOUR.

I do not propose to discuss the various obstetric conditions which call for the induction of premature labour, such as the death of the fœtus, narrow pelvis, and the like, but to consider the circumstances under which it may be necessary on account of the presence of some internal disease in the mother. It must be remarked that absolute indications can be laid down only in a relatively small number of cases, and that opinions on the matter change considerably from time to time.

CARDIAC DISEASE.

If endocarditis supervenes during pregnancy it is not necessary to arrest the latter if the heart function remains unimpaired and the organ retains its tone, that is to say, if signs of actual heart failure are absent. If the endocarditis is recurrent in type; if it is associated with high fever; if dyspnœa, arythmia, cyanosis, and signs of congestion of the liver, spleen, and kidneys are present, and the lower limbs are œdematous: then premature labour should be induced, unless the condition improves rapidly under internal treatment. Abortion and premature labour not infrequently occur spontaneously under such circumstances.

If valvular disease or a heart muscle affection exists when pregnancy begins, it is not necessary to induce labour if compensation is satisfactory. Many women pass through pregnancy without any untoward symptoms in spite of such lesions.

On the other hand, grave defects in compensation, extensive œdema, arythmia, dyspnœa, pulmonary and hepatic congestion, justify induction of labour in my opinion, even if cardiac remedies diminish the symptoms of defective compensation. In such cases a return of symptoms is to be feared, and during the further course of the pregnancy they may run a rapid course and prove fatal. But the operation will not be undertaken while the symptoms of defective compensation are at their height, unless there is good reason to believe that no further improvement under treatment can be expected ; if induced under such unfavourable circumstances the labour may further embarrass an already grave condition.

When defective compensation is of long standing, even though only of small degree and unassociated with œdema, premature labour should, in my opinion, be induced.

In mitral disease, particularly mitral stenosis, if disturbances of compensation, even of a slight degree, supervene in the course of pregnancy, it is advisable to interfere, if improvement does not rapidly occur under treatment. Experience has shown that it is in this form of cardiac disease that sudden and dangerous symptoms are particularly liable to arise ; 42 per cent of the cases of this kind reported in the literature have ended fatally, but this percentage is of course unduly high, the fatal cases being those usually reported.

In general it is legitimate to persist in expectant treatment in the second half rather than in the first half of pregnancy, the strain on the heart increasing only slightly during the second half. Spontaneous abortion occurs in about a fifth of women suffering from heart disease.

If heart disease is complicated by renal disease, it is necessary to interrupt pregnancy, even if there are no defects of compensation ; the same is also indicated in the rare association of recent phthisis and cardiac disease.

Labour may be induced in cases of well-compensated heart disease by the bougie ; in grave disturbance of compensation with pulmonary œdema by puncturing the membranes.

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DISEASES OF THE RESPIRATORY ORGANS.

Laryngeal Tuberculosis.—There is general agreement on the fact that laryngeal phthisis progresses rapidly during pregnancy, and may give rise to alarming symptoms. I have seen this rapid progress of the disease in several of my own cases. The induction of premature labour has consequently been urged in this condition by many authorities; it should be done as soon as possible once the diagnosis has been definitely established. The progress of the disease is usually arrested by the operation; if it is not done it is often necessary to have recourse to tracheotomy.

Pulmonary Tuberculosis.—As in the case of laryngeal disease, pulmonary phthisis is usually aggravated by pregnancy. Old-standing stationary disease becomes progressive, and recent disease progresses with increased rapidity. Florid tuberculosis or subacute miliary tuberculosis is thus found by no means rarely among pregnant women, and most authorities counsel the induction of labour, the only difference of opinion being as to the stage at which it should be brought about. Thus Paddok would undertake it only when the child has reached a viable age; Heymann advises it when there is evidence that the pregnancy is influencing the lung condition unfavourably; whilst Acconi recommends it even when the disease is in an early stage.

From my own experience, and a study of the literature on the subject, the following indications appear to me to be sound:—

1. When a case of old-standing phthisis shows signs of a reawakening of the disease, however moderate, with the

onset of pregnancy; for example, when fever or an attack of hæmoptysis supervenes, abortion or premature labour should be induced at once; in several instances of this kind where I have delayed I have seen florid tubercle or miliary tubercle develop.

2. When the physician, from previous knowledge of the patient, is aware of the presence of the so-called erethic form of tuberculosis, pregnancy should be interrupted as early as possible, to escape the development of fatal lesions in the lungs.

3. When pulmonary tubercle is associated with other foci of the disease elsewhere, the induction of premature labour is absolutely indicated.

4. It is advisable even in stationary tubercle, when the patient is a multipara, and it is known that the pulmonary disease has increased in gravity during previous pregnancies.

5. Some writers have expressed the view that in the case of miliary tubercle the induction of labour should be delayed with a view to obtaining a living child. With this opinion I do not agree. The disease in the mother is aggravated by the pregnancy, and there is no guarantee that a healthy child will be obtained.

Pneumonia.—Abortion or premature labour often occurs spontaneously in this disease. Judging from the literature, it may be expected in about half of the cases, although Fellner's statistics do not show so high a percentage as this. Seeing that labour throws extra strain on the already overtried heart, and that experience shows that pulmonary œdema is especially to be feared in cases in which abortion takes place, it is generally unwise to induce labour. According to Fischer, the mortality in patients who are left alone is about 14 per cent, in cases in which labour is induced about 72 per cent.

Pleurisy.—In pleurisy the case is very much the same as in pneumonia. Since labour adds increased risk to the attack, and the latter as a rule has no harmful influence on the further progress of the pregnancy, the induction of abortion or premature labour is inadvisable.

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DISEASES OF THE BLOOD.

According to Sanger, pregnancy aggravates the course of *Leucæmia*. This author and Fellner advise that, if the disease is not of a serious type, premature labour should not be induced until there is a prospect of obtaining a living child, but that if the type is grave and the symptoms increase in severity on the onset of pregnancy, labour should be induced without delay.

In *Progressive Pernicious Anæmia* the production of abortion is not indicated in the interests of the mother; it cannot save her, and only hastens the progress of the disease. It is also contra-indicated in the interests of the child, except in an occasional case.

In *Scorbutus* and in the rare condition of *Hæmophilia* in the female, profuse hæmorrhage is to be feared, whether parturition takes place naturally or is brought on artificially. No case of fatal post-partum hæmorrhage due to these affections is, however, on record, and in view of this and the fact that induction of labour has no particular influence in arresting or improving the diseases in question, it is not advisable to interfere.

States of marked *Cachexia*, resulting from malignant growths, malaria, and other affections, call for the induction of abortion, with a view to giving the patient relief. There is no necessity to consider the matter from the point of view of the child, as in most cases, even when the pregnancy goes on to term, a viable infant is hardly ever obtained.

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THE INFECTIOUS FEVERS.

In most of the acute infective fevers the interruption of pregnancy is contra-indicated, as the effect on the mother is to aggravate the disease.

In *Enteric Fever* labour brings with it increased risk of pulmonary complications, intestinal hæmorrhage, and perforation. In many cases the course of pregnancy is not interrupted by the disease, and it is useless and dangerous to induce labour artificially. In two cases under my care the patients passed through an attack without accident; in a third case, of a severe type, labour came on only when a relapse supervened, and a living child was born.

In *Scarlatina* induction of labour is contra-indicated, on account of the danger of septic infection; the same is true of *Small-pox* and *Diphtheria*, and, in my opinion, of *Erysipelas*, although, according to Fellner, intervention can be undertaken in the latter without this risk. I have never come across a case in which it was necessary.

Measles is especially dangerous during the puerperium, so that labour should never be induced in this disease. It is necessary in the course of *Influenza* only when there are complications which specially call for it.

In *Tetanus* the attacks are liable to be increased in severity if labour comes on; therefore it is never to be induced.

In *Malaria*, if the attack is slight or only of mean severity, there is no necessity to interfere; but if the condition is one of marked malarial cachexia, pregnancy should be terminated; it seriously compromises recovery, and with the mother in this condition the child is usually ill-developed and rarely lives.

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DISEASES OF THE KIDNEY. ECLAMPSIA.

Albuminuria occurs in a relatively large number of pregnant women. The onset of nephritis, with abundant elimination of corpuscular elements and albumin, although not so common, occurs in a considerable number, and the question of terminating pregnancy by artificial means often arises in connection with this condition. Cases in which nephritis has been present before the pregnancy commenced offer the same problems.

If albumin and casts are found in the urine, and no alarming symptoms are present, it is advisable to leave things alone for a short time and see the effect of a milk diet. If the albumin and casts diminish under this régime the pregnancy may be allowed to run its course, the patient meanwhile being watched with great care. If, however, any dangerous symptoms arise, or if the signs of renal

irritation do not completely disappear in the course of about a fortnight under strict milk diet, it is necessary to procure abortion or labour as the case may be.

The following must be interpreted as dangerous symptoms: reduction in the amount of the urine, marked œdema of the legs or elsewhere, severe headache, frequent vomiting dating from the onset of the renal symptoms, paralytic phenomena, increase in the amount of albumin, and signs of cardiac disturbance. If albuminuric retinitis or uræmic amaurosis supervene, intervention is urgent, and the risk of delay great; according to Silex, of 22 cases with these symptoms 6 became blind, and in 10 the sight was permanently damaged.

Pregnancy is associated with great risk to a patient with chronic nephritis, and it is justifiable to interrupt it; according to Fellner the mortality in this condition is 40 per cent, but this figure is based on a small number of cases only. Eclampsia occurs in a third of these cases. If the patient has already passed through the first half of her time when first seen, without any untoward symptoms, it is justifiable to wait until a living child may be expected, and then induce labour. The mother must, of course, be carefully watched during this time of waiting.

When there is a history of nephritis during a previous pregnancy from which the patient recovered, the progress of events must be watched, and if signs of the disease reappear labour must be brought on. Of 26 such cases in Schauta's clinic 22 showed no renal symptoms during the later pregnancy.

Eclampsia constitutes a vital indication for terminating pregnancy if the attacks are in the least degree frequent or severe. The mortality is 12·5 per cent in Fellner's tables; other writers give a higher figure (Schnürer 21 per cent). I would not hesitate for a moment to recommend immediate interference after a single attack of any severity. Intervention offers practically the only hope if the patient is in a state of coma following eclampsia.

In the presence of slight seizures some obstetricians recommend waiting, provided the attacks do not follow one another rapidly, and the patient is in good condition in the intervals.

In about half the cases labour ends the seizures (Schnürer);

others record higher percentages of recovery, up to 80 per cent. Intervention should be practised under deep anæsthesia.

Hæmaturia of renal origin presents the same indications as albuminuria. It may be present as one of the signs of nephritis. When due to some other renal condition it will necessitate interruption of pregnancy if oft repeated and copious; the pregnancy aggravates the tendency to hæmorrhage.

If *Pyelonephritis* is discovered in a pregnant woman, and if ordinary therapeutic measures have no marked effect, abortion should be procured. But if the affection has developed during the pregnancy, and no dangerous symptoms are present, it is justifiable to wait until a living child can be obtained, and then induce premature labour.

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DISEASES OF THE STOMACH.

Hæmatemesis.—Hæmatemesis is met with from time to time in pregnant women, and is usually due to gastric ulcer. If it does not yield to careful medical treatment, and recurs to such a degree as to threaten a fatal issue, the pregnancy

must be interrupted to enable complete rest to be given to the stomach. The question will sometimes arise during the second half of pregnancy, and premature labour may then be indicated with a view to obtaining a living child.

Hyperemesis Gravidarum.—In the great majority of cases this is a transitory condition, or can be checked sufficiently to avoid any serious risk to the mother. If, however, all internal and external methods of treatment have been exhausted without success, and the vomiting continues to such a degree that the development of a viable child becomes doubtful, it is justifiable, and under such circumstances often absolutely necessary, to bring the pregnancy to an end. This, however, must be looked upon only as a last resource, when all other methods have failed.

In a case which I saw several times in consultation during the second month of pregnancy, the patient was so reduced by a fortnight's persistent vomiting that her life was seriously endangered. She vomited incessantly day and night, she wasted rapidly, and her condition was one of collapse, with subnormal temperature and starvation-delirium. Abortion was procured, and she rapidly recovered from her very dangerous state.

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APPENDICITIS.

Appendicitis during pregnancy is not rare. Most writers have taken a very grave view of this complication, and, judging from recorded cases, the mortality is very high. As a matter of fact the combination is not a particularly dangerous one. I have seen a considerable number of first attacks of appendicitis which supervened during pregnancy. Perhaps there is an element of chance in the fact that none of these cases were fatal, nor, in fact, presented any particularly serious symptoms. Labour during appendicitis certainly increases the risk of the latter; an abscess

may rupture or the process may extend after delivery, and induction of labour is contra-indicated. It not uncommonly occurs spontaneously. Fellner's view that in the catarrhal form of the disease the induction of labour might be advantageous, is really only of theoretical interest, as we have no certain guides to distinguish the purulent from the non-purulent type. If it is necessary to intervene in a case where appendicitis is complicated by pregnancy, the appendix, not the uterus, should be attacked.

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DISEASES OF THE LIVER.

Cholelithiasis.—The frequency of attacks of biliary colic during pregnancy is recognized; they are at any rate not uncommon. They are often of a severe type and associated with fever. It is never, however, necessary to provoke labour on account of such attacks; if interference is necessary, operation for removal of the biliary calculi is what is indicated.

Jaundice.—The so-called "icterus gravidarum," which is a very rare affection, is an indication for the induction of premature labour. It is characterized by subcutaneous and submucous hæmorrhages, with high fever and delirium, and leads up to acute atrophy of the liver. It attacks women at about the mid-period of pregnancy, and appears to be favourably influenced by the termination of the pregnancy. If the affection is diagnosed, it is necessary to bring on abortion or labour without delay.

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DISEASES OF THE NERVOUS SYSTEM.

Hysteria.—It is generally held, and with the opinion I agree, that even in the case of hysteria of a very severe type it is very rarely necessary to end the pregnancy artificially. Such a necessity may arise occasionally, for example, if a patient refuses to take food and vomits repeatedly when forcibly fed ; but in the great majority of hysterical patients there is no need for interference.

Epilepsy.—According to Binswanger, pregnancy often exercises a harmful influence on the course of this disease, and results in permanent aggravation. If the attacks become more frequent in spite of suitable treatment, if they are of a severe type and the free intervals become shorter, if psychic symptoms supervene which were not present before the pregnancy, it is necessary, in the opinion of many authors, to procure abortion. In my opinion, the necessity is urgent under such circumstances ; there is an imminent risk of the onset of a status epilepticus and a fatal ending.

Chorea.—Chorea gravidarum is an affection in which the prognosis is grave, and differs in this respect entirely from ordinary chorea. The mortality is very high, and according to Schrock and Rust reaches 25 per cent. Some of the fatalities occur during labour itself, and this is a critical time. Of 95 women delivered at term, 8 died in labour (Schrock) ; delivery in the earlier months is much less dangerous.

The disease, therefore, makes it necessary to terminate pregnancy in the first few months whenever possible, if the woman is to be saved from serious risk. If the pregnancy is already far advanced when the patient is first seen,

premature labour will only be induced if she is already much enfeebled and is the subject of psychic disturbances. Once the pregnancy has passed its mid-term, labour becomes as serious a risk artificially procured as when it is allowed to take place naturally ; it will, therefore, be induced during this period only when the enfeeblement or psychic troubles referred to have supervened.

Tetany.—The painful cramps of tetany usually disappear after labour. Although the affection is painful and distressing it is not, as a rule, associated with any danger, and there is usually no necessity to induce labour. If, however, the seizures are very frequent and tend to increase in duration, and, as I have seen, hardly give the patient an hour's peace, when the infant is viable, it is an act of humanity to induce labour.

If the attacks become generalized and involve laryngeal and respiratory muscles, it is necessary to terminate the pregnancy without delay, as the risk to life under these circumstances is great.

Polyneuritis Gravidarum.—If a severe type of polyneuritis involving the upper and lower limbs supervenes during pregnancy, and if no cause other than the pregnancy can be discovered, it is advisable to induce abortion or premature labour, on account of the very serious prognosis of this form of the disease. In such cases, if the pregnancy is allowed to continue, the motor and sensory phenomena tend to increase in severity and to extend to new regions, whereas if the pregnancy is brought to an end the inflammatory affection of the nerves rapidly disappears.

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Appendix II.

OPERATIONS ON DIABETICS.

The frequency of diabetes, and the fact that surgical complications are not uncommon in the disease, makes the discussion of the indications for and contra-indications to operation often necessary.

The indications have to be considered from two points of view : (1) The indications for operation in the case of actual complications of the disease ; (2) The indications for operation in affections which are not etiologically connected with the diabetes itself.

The most frequent surgical complications of diabetes are : gangrene of the lower limbs, perforating ulcer of the foot, diabetic mastoiditis, phlegmonous or gangrenous inflammations of the skin, carbuncle, cataract.

1. *The indications for operation in the complications of diabetes.*

(*a.*) In all surgical inflammatory complications of diabetes it is necessary to operate if the complication involves risk to life whether the diabetes is slight or severe in type.

(*b.*) In inflammatory diabetic gangrene, operation must not be delayed if diet and conservative treatment do not arrest the progress of the condition, and also if there are signs of threatening general infection, lymphangitis, rapid pulse, and high fever.

(*c.*) When operation is not urgent, almost all writers advise the reduction of sugar to the lowest possible point before it is undertaken ; but when the diabetes is of a mild type this preliminary treatment is thought unnecessary by many (Körner, Sternberg).

(*d.*) In diabetic cataract operation may be undertaken as soon as the cataract is sufficiently ripe ; antidiabetic treatment is useful, but it is not necessary to wait until the sugar has gone from the urine.

Many surgeons advise operation in the inflammatory complications if the pain is severe and the patient cannot be well looked after. In the non-inflammatory type of gangrene it is advisable on the other hand to await the formation of a line of demarcation, and meanwhile to institute antidiabetic treatment.

Contra-indications.—When there is no urgent call for operation, it should be avoided in severe diabetes with diaceturia; if it is necessary to operate under such circumstances, a general anæsthetic should be avoided if possible.

2. *When are operations allowable in diabetes?* When a diabetic has some other affection which will endanger life if left alone, most physicians and surgeons agree that operation should not be delayed. A malignant growth is an example of such an affection.

If it is possible, however, to wait awhile, the sugar should be reduced as much as possible. In the opinion of many it is not necessary to delay until the sugar has disappeared from the urine, but operation should not be done if acetone and acetic acid are present.

"In many cases the time for operation is when treatment has freed the urine of sugar" (Kausch). One will hesitate less when the operation called for is only a slight one, and the necessary narcosis short. Regnier's view that absence of patellar reflex is a strict contra-indication to operation is not now entertained.

Contra-indications.—Operations which are not absolutely necessary, such as cosmetic and orthopædic procedures, are not advisable in the presence of diabetes. The disease is always an argument against operation. Operations which require a prolonged anæsthesia should not be done unless for some affection which threatens life. Furunculosis, gangrene, and other such complications, are generally to be viewed as contra-indications to operation elsewhere. Other contra-indications are acetonuria and diaceturia, advanced arteriosclerosis, signs of heart muscle degeneration, and marked albuminuria.

The risks of operation.—In a considerable number of cases diabetic coma has supervened directly on narcosis; this consequence is especially to be feared if diacetic acid is present in the urine before operation. It is true that

many surgeons have seen no instance of coma among a large number of cases (Gersuny-Sternberg 85 cases).

It does not appear to be of any moment whether ether or chloroform is employed, but many prefer the former.

Coma may also supervene some days after operation. In 100 cases of diabetic gangrene recorded by Wolf with 50 deaths, 19 died from coma; of 22 of the fatal cases who were not operated on, coma was the cause of death in 6 (27 per cent), whereas it was responsible in 13 cases (46 per cent) out of 28 on whom an operation was performed.

In several cases serious hæmorrhage has been recorded either at or after the operation, apparently to be ascribed to some affection of the small vessels.

Wounds are specially easily infected in diabetics, and gangrene of skin flaps after amputation is relatively common, especially in the lower limb. To avoid an acid intoxication Naunyn recommends that bicarbonate of soda should be administered for some time before operation, either by the mouth or intravenously.

Results of operation.—By careful aseptic methods much better results can be obtained than used to be thought possible; this is true both with regard to operation for ordinary affections in diabetics and also for the complications of the disease itself. According to Wolf's tables, which relate only to diabetic gangrene, 50 died out of 110 treated by expectant methods (45 per cent), 28 out of 75 operated on (37 per cent); of the first, 13 recovered completely (12 per cent), of the latter three times as many. Körner's statistics deal with diabetic mastoiditis; in 13 with slight diabetes the wounds healed on an average in nine weeks; in no case did the operation permanently aggravate the diabetes. In 5 cases where the disease was of moderate severity the wounds healed completely, and no aggravation of the diabetes occurred. Of 9 cases of severe type death followed operation in 4, in 2 transitory coma occurred.

Sternberg collected 10 cases of diabetes operated on in Gersuny's clinic, 4 of which suffered from the disease in a severe form. In spite of the fact that in several the operation was an extensive one (cholecystectomy, major operation on the maxilla, etc.), death resulted from the operation in none, and in more than half complete recovery followed. Of

75 cases suffering from carbuncle, 5 died from sepsis in spite of free incisions.

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Appendix III.

THE GENERAL INFLUENCE OF OPERATIONS ON THE BODY.

By Dr. Julius Schnitzler.

Operations have been robbed of their terrors by anæsthesia, their risks by asepsis, and of the greater part of their uncertainties by improvements in technique; yet every operation produces a certain amount of psychic and somatic trauma, which must be taken into account in calculating its therapeutic effect. It is necessary to enquire into this traumatic influence with a view to lessening it as far as possible in all cases.

POST-OPERATIVE PSYCHIC DISTURBANCES.

Operation has a psychic influence on the patient from the moment when it is suggested to him by his medical attendant, and often persists for a considerable time after recovery is otherwise complete. The degree of apprehension varies very much according to the temperament of the patient, but it cannot usually be exactly foreseen; some phlegmatic individuals are stirred up into a state of terror by the word operation, whilst others of a neurotic type show no particular alarm, and agree readily. The nature of the affection for which operation is necessary, the pain, and the degree of inanition, etc., play a considerable part. The slight psychic disturbance which is inevitable in all cases is usually of short duration, but occasionally operation is followed by permanent mental effects; happily, this is rare.

Apart from the occurrence of delirium tremens and inanition delirium, alcoholism, advanced age, and inanition are sometimes responsible for post-operative psychoses. Operations on the eye are specially liable to be followed by

menta disturbance, and retention for a long time in a darkened room appears to favour this tendency.

Both in the female and the male, operations on the sexual organs sometimes cause mental disturbance; in the male, this is especially notable in the case of ablation of the testes and removal of the prostate.

The prognosis of post-operative psychoses is not particularly favourable; a fatal result is not uncommon in old men and patients suffering from inanition; and apart from the danger to life such mental disturbances tend to persist. They must be looked upon as the result of operative shock on predisposed individuals, and are therefore quite different in etiology from the toxic delirium which sometimes follows operation, for example, the delirium of iodoform poisoning.

SHOCK, PNEUMOTHORAX.

The risk from the onset of these conditions must always be discussed in forming an opinion as to the advisability of operation; it is only in rare instances that the risk from mental disturbance has to be taken into consideration. Operative shock is a term which needs definition; it is now used not for the temporary syncope which may occur in the course of operations done without anæsthetics, but for the state which is to be expected after all operations of magnitude whose chief sign is a more or less pronounced fall in blood pressure. It may be principally due in any given case to excessive loss of blood, or to long exposure and chilling of wound surfaces, or to the handling of organs which possess special nervous sensibility. In degree it varies from a slight transient effect passing off in the course of a short time to a condition so profound that no remedies are capable of warding off a fatal result. In every case the amount of shock to be anticipated should be estimated beforehand, and means taken to obviate its onset.

The sudden development of pneumothorax in the course of an operation on the chest is attended by risk to life. This is due, not to the fact that the respiratory function of the lung is suspended, but to the sudden change of pressure on the right side of the heart and the sudden deviation of the mediastinal structures towards the opposite side. In

order to avoid this accident in the course of operations on the lung the latter may be fixed to the pleura in such a way as to prevent the sudden inrush of air. Other means, recently suggested, are the performance of such operations in a chamber in which the air pressure is kept low by artificial means, or the introduction of air under increased pressure into the respiratory channels. These methods are still on their trial. Obviously the danger from pneumothorax is greater if the opposite lung is not functioning normally. If adhesions exist between the visceral and costal pleura, pneumothorax can be avoided; it is, therefore, important to examine for signs of such adhesions, and in cases where they do not exist they are sometimes produced artificially by sutures; sutures of silk soaked in turpentine have been employed for the purpose. There is comparatively no risk in opening the pleural cavity when the lung has been already compressed by effusion; the danger varies with the suddenness of the onset of the increased pressure, and when a pneumothorax is inevitable it is important to ensure that the entry of air takes place slowly and steadily, and to cut short the duration of the pneumothorax as much as possible by suturing the lung to the pleural wound.

THE EFFECTS OF OPENING THE ABDOMEN, THE CRANIUM, AND THE SPINAL CANAL.

Opening the abdomen is in itself free from danger; certain complications alone call for remark. If a large quantity of fluid is suddenly withdrawn from the abdomen, the blood pressure may be suddenly lowered in such a manner as to seriously embarrass the heart. When the abdomen is greatly distended, laparotomy is followed by herniation of the intestinal coils, and the manipulations necessary to retain and replace them may produce severe shock and syncope. The ordinary manipulations of the abdominal organs are, generally speaking, well borne, and in deep anæsthesia their effect on the pulse is minimal. In incomplete anæsthesia, for example in anæsthesia by the local infiltration method, the effects of these manipulations on the pulse is more marked. Pulling on the mesenteric attachments of organs in particular tends to produce shock,

irregular pulse, and a fall in blood pressure, but in ordinary cases there is no actual risk to the patient. More danger is associated with prolonged exposure of the abdominal organs; pneumonia after laparotomy is probably due to this cause, and there is no doubt that chill produced in this way is responsible for shock and an increased susceptibility to infection. Means must be taken to prevent this by protecting any exposed organs and wound surfaces, not only in laparotomy but in all other operations.

Exposure of the cranial cavity or the spinal canal is not in itself associated with any degree of risk to life. The alterations in the cerebral circulation which follow trephining are not of so much importance as some authors have thought. When the resulting defect in the skull persists, there are special dangers, in particular hernia cerebri and adhesions between brain and meninges.

When the intracranial pressure is much above the normal, as, for instance, in cases of cerebral tumour, the sudden escape of cerebrospinal fluid may give rise to alarming symptoms, respiratory and cardiac failure, and even sudden death. Hæmorrhage may also occur into the tumour, an accident which has also been observed after the withdrawal of fluid by lumbar puncture. It is, therefore, necessary to prevent any sudden escape of the fluid, especially when it is under great pressure. The brain, however, tolerates well the mechanical irritation of the ordinary intracranial operations; for example, the prolonged retraction with a spatula which is necessary during resection of the Gasserian ganglion.

There is greater risk attached to the exposure of the spinal cord; the operation is more severe, and therefore more likely to be followed by shock. In addition to this the cord itself is less tolerant of pressure, and the removal of tumours from the canal is more likely to be followed by paralyses and other phenomena of trauma than in the case of the brain. As has been already said, in ordinary cases opening the skull is free from any considerable risk, and in the more serious cases the risk does not compare in gravity with the affection which it is sought to relieve.

In cases where the opening in the skull is left patent, or cannot be closed, epilepsy is particularly liable to occur as a late effect. At one time it was held that it was

inadvisable to close such defects, and they were left open, with the idea of providing against the evil effects of variations in intracranial pressure, and as a prophylactic against epilepsy. It is now known that the results of this recommendation are liable to be the opposite to those desired, and that, in addition to epilepsy, mental disturbances are common. Cerebral hernia has already been mentioned; it occurs, of course, only in cases where the skull defect is not closed, and may lead up to epileptiform attacks and other disturbances of cerebral function. Skull defects should, therefore, be closed, except where trephining is done simply for the relief of intracranial pressure, as in the case of inoperable brain tumours.

THE EXTIRPATION OF GLANDULAR ORGANS.

Permanent effects follow the extirpation of the whole, or more than three-fourths, of the thyroid gland; operative myxœdema supervenes, and tetany also if the parathyroids are removed at the same time. About a third of the gland should always be left; but it is, of course, necessary to break this rule in the case of carcinoma. In the latter case the onset of myxœdema must be combated either by transplantation or administration of thyroid substance. The surgeon is hardly likely to be called upon to remove any considerable portion of the pancreas. Certain cases of suppuration and necrosis of the organ have shown that the loss of the greater part of the pancreatic tissue is liable to be followed by diabetes, so that there are physiological as well as technical objections to its removal.

Reference has already been made to the mental disturbances which may follow castration; for the purpose of influencing prostatic enlargement the operation is now practically abandoned; in subjects who have passed puberty no somatic changes of importance have been noted.

The removal of the ovaries from women who have reached puberty produces an acute menopause which is liable to be associated with subjective cardiac symptoms, and certain mental affections, irritability or melancholia, and even mania; progressive obesity is often also a consequence. The nearer a woman is to her natural menopause

the less liable is she to be disturbed by extirpation of the ovaries. The operation is justified, not only in the case of malignant disease, but in certain forms of inflammatory disease also (tuberculosis) and in osteomalacia. Proof is still wanting that it is a justifiable proceeding in inoperable breast cancer.

The surgeon need never hesitate to resect liver tissue on physiological grounds; the individual is capable of doing without a greater proportion of his liver substance than any surgeon would find it possible to remove.

In the case of the bilateral glandular organs, if one be removed, the other, when healthy, is capable of undertaking the work in virtue of its capacity for compensatory hypertrophy. This is particularly exemplified in the case of the kidneys. Cases, however, are met with from time to time, where after nephrectomy the opposite organ not only refuses to take up the extra work, but ceases to functionate altogether; this accident is usually ascribed to reflex action, and the condition is termed reflex anuria. As a matter of fact, no complete explanation has yet been offered; it is analogous to the anuria which sometimes follows the impaction of a calculus in the ureter of one side. Sometimes this occurs when the kidney left appears to be entirely healthy, but it is far more liable to happen if the function of the latter is compromised. Hence the great importance of investigating the functional efficiency of the opposite organ when nephrectomy appears to be indicated. Formerly it was held that if the amount of urea excreted was less than half the normal, no operation on the kidney of any kind was justifiable. To-day the examination of the renal function is carried further; means are taken, either by catheterization of the ureters or by the use of the urine separator, to obtain urine from each kidney, and the specimens so obtained are examined as to their cryoscopic point, and also as to the amount of sugar excreted after the injection of phloridzin. The cryoscopic point of the blood is also ascertained; it is held that if this is below ·56 the prognosis of nephrectomy is doubtful. No absolute conclusion can, however, be based on the latter method; nor does the discovery that the kidney which it is proposed to leave is of normal function enable one to predict with absolute certainty that it will respond satisfactorily to the extra

demands made upon it by nephrectomy. These methods of examination are, however, of great value, and should be employed in all cases. Too much weight must not be given to unfavourable results from these methods when the affection of the kidney which appears to call for nephrectomy is one which menaces life; for example, in advanced suppurative nephritis, the removal of the affected kidney may be the patient's only chance of regaining health.

Extirpation of the spleen is well borne as far as functional conditions are concerned; this has been proved by many operative experiences. After splenectomy the blood shows no permanent alteration.

ANÆSTHETICS.

The question of the influence of an anæsthetic on a patient is always one of importance.

Local Anæsthetics.—In using cocaine in strong solutions its toxicity must be remembered; not more than 5–6 centigrams ought to be injected, and half this amount in the region of the head. As far as possible its absorption should be prevented by placing some form of tourniquet above the seat of injection. The injection of the stronger solutions (several grams per cent) into the urethra and bladder is undoubtedly risky. Reclus, it is true, considers the drug harmless after a large personal experience of its use, but the practitioner will do well to remember that serious symptoms of intoxication do occur in a certain number of cases, and that special susceptibility to its action is by no means rare. In these cases, vertigo, nausea, vomiting, respiratory spasm, and loss of consciousness may supervene. If they occur they must be met by artificial respiration and amyl nitrite, and later by the administration of coffee and brandy.

It is best to avoid strong solutions of the drug altogether for subcutaneous injection, and either employ one of the substitutes, eucaine or tropacocaine, which are almost if not quite non-toxic, or to use it in the dilute solutions (1–2 : 1000) recommended by Schleich. The solutions of Schleich are in normal salt solution, with the addition of small quantities of morphine. Although it is possible by the use of these solutions to render painless even operations of considerable magnitude, yet most surgeons prefer a

general anæsthetic under these circumstances, to avoid psychic shock and the being dependent on the intelligence and character of the patient.

Of the weakest solutions of Schleich as much as 50 ccm. may be used without risk of intoxication; although such an amount contains 5 centigrams of cocaine, in this weak dilution the toxic effect is much less than when injected in concentrated solution. The addition of adrenalin, recently recommended, ensures a more intense and a longer anæsthesia; the small amounts which have been employed have no general effect, but occasionally some local necrosis has been caused. The method of spinal anæsthetization, introduced by Bier, has several disadvantages. It is uncertain, it can only be used for operations on the lower part of the body, and it has in several cases caused death. It has yet to be shown whether toxic effects can be obviated by substituting tropacocaine for cocaine. In a certain number of cases the latter causes fever, malaise, nausea, vomiting and intense headache, and has no advantage over a general anæsthetic in this respect.

General Anæsthetics. — Of the general anæsthetics, reference will be made here only to chloroform and ether. The other substances, bromethyl, ethyl chloride, pental, etc., are of less practical importance, and experience has shown that they are no safer.

In the case of chloroform, risk of paralyzing the respiratory centre is to be avoided by regulating the dose. This paralysis must not be confused with the spasm of the respiratory muscles which occurs in the early stages of narcosis. If respiratory arrest takes place, recovery will follow withdrawal of the anæsthetic and artificial respiration if the pulse remains good. With regard to the effect of chloroform on the heart, it has been shown that it is particularly in abnormal conditions of the heart *muscle* that danger is to be anticipated, whilst patients with valvular disease which is well compensated stand the anæsthetic well. Death from heart failure during or immediately following chloroform anæsthesia takes place relatively frequently in patients with the so-called status thymicus, and, according to the recent researches of Wiesel, this is due to the deficiency of chromaffine substance, which has a regulating effect on the blood pressure. Unfortunately,

the diagnosis of this dangerous state is not easy; it is shown by dullness over the manubrium sterni, slight hypertrophy of the spleen, a goitre of small dimensions, and, most important of all, hypertrophy of the tongue follicles. Patients with this condition tolerate badly surgical intervention of all kinds; therefore, only absolutely necessary operations should be performed on them, and either under ether or local anæsthesia.

Pulmonary disease is no contra-indication to chloroform, unless it is acute, or, if chronic, of a very extensive type.

Slight diabetes does not contra-indicate chloroform narcosis, but in the case of severe diabetes, coma is liable to follow anæsthesia, especially if the urine contains acetone or acetic acid. Patients who are suffering from septicæmia, or some acute febrile disorder, only require small doses of anæsthetic; with larger doses there is grave danger of heart failure. Great care is necessary in administering chloroform in cases of patients with extreme meteorism; the movements of the heart are embarrassed by the elevation of the diaphragm. There is risk also of aspiration of vomited matters, but this can usually be avoided by previously washing out the stomach. In every case the degree of anæsthesia necessary must be specially considered, and the anæsthetic not pushed beyond this; it should be remembered that large doses of chloroform may cause serious organic lesions; albuminuria and jaundice are sometimes directly attributable to its toxic effect, and it sometimes also has a distinct deleterious action on the myocardium.

Ether is a distinctly less harmful anæsthetic than chloroform. In the dose which is necessary for anæsthesia it has a distinct stimulating effect on the heart, and it has no such marked tendency to paralyse the respiratory centre as chloroform. Its effect on the respiratory passages is, however, greater, and in a certain number of cases it is responsible for pneumonia and bronchitis. This effect may be for the most part avoided by administering the anæsthetic in proper dilution and gradually. It does not appear to have any harmful influence on the kidney or the liver.

Ether is, therefore, preferable to chloroform for patients with cardiac or renal disease; it is contra-indicated in emphysema and bronchitis.

For operations of short duration, such as tooth extraction and simple incisions, it is only necessary to use small amounts of ether to produce a condition of intoxication rather than narcosis, in which there is analgesia rather than actual anæsthesia.

It is often the most rational plan to use a mixture of chloroform and ether; and the mixture of Billroth which contains alcohol also is one very largely in use.

Morphine is an assistant to narcosis which is not so much used as it deserves. I advocate a dose of 1–2 centigrams about half an hour before the general anæsthetic. It is contra-indicated only in children and in patients suffering from septicæmia. Less of the general anæsthetic is required if this be given beforehand; in alcoholics in particular it is often hardly possible to obtain satisfactory narcosis without it.

Certain effects of narcotics on already existing affections must be noted. In certain states of intoxication and infection chloroform appears to aggravate the condition, and in particular its effect on the state of the heart. This is sometimes seen in the case of operations on septic abdominal foci; even though the operation itself may be slight, the symptoms, and particularly the heart symptoms, are in certain cases markedly augmented after anæsthesia. In patients suffering from such intoxications and infections, ether is certainly to be preferred to chloroform.

THE INFLUENCE OF CERTAIN DISEASES ON THE INDICATIONS FOR OPERATION.

The indications for operation in the case of patients suffering from some complicating disease vary according to the seriousness of the condition which the operation is designed to relieve. On the one hand, affections which imminently threaten life will be operated on whatever associated disease may be present, unless the patient is moribund; and, on the other hand, one will hesitate to operate for the relief of some cosmetic disability if the patient has some affection which increases the risk. Between

these two extremes there are a whole series of conditions, each of which must be judged on its merits.

It has already been remarked that well-compensated *Heart Disease* does not contra-indicate operation when this is called for by some disability of importance. Intervention in the presence of defective compensation is always risky, but is not contra-indicated when life is threatened, and, in particular, in the case of operations undertaken to relieve the circulatory embarrassment, evacuation of ascitic or pleuritic effusion, the removal of large abdominal tumours, and the like. Sometimes, when valvular disease is well compensated, a troublesome tachycardia follows operation, but this usually yields to the application of an ice-bag and to drugs, such as digitalis and strophanthus.

In *Arteriosclerosis* there is risk of cerebral hæmorrhage, and I have seen this fatal in two cases; the one a case of carcinoma of the breast, the other a myoma uteri. In the latter case the operation was done with the pelvis elevated, a position to be avoided under such circumstances. In the presence of serious disease of heart or vessels, each case must be judged separately. I consider that a patient who has a scirrhous cancer of the breast or a squamous carcinoma should be left unoperated on if there is at the same time a serious cardiac lesion; both are slow-growing cancers, and the patient will probably live longer if left alone. On the other hand, in such a condition as chronic intestinal stenosis in a patient with heart disease, the stenosis should be operated on, the danger from this being greater than that from the cardiac affection.

In patients suffering from *Tuberculous Disease* it is well known that operative interference on local tuberculous foci may be occasionally followed by dissemination. It is impossible to foresee such a deplorable consequence, and the great majority of such operations are well borne. In the case of patients with pulmonary tuberculosis the effect of the disease on operative procedures elsewhere depends upon its stage. In the presence of florid phthisis, radical procedures not involving a long convalescence are preferable to the more conservative; but when the pulmonary disease is not active the latter measures are more justifiable. Ether as an anæsthetic is generally to be avoided for phthisical subjects. Circumscribed tuberculous foci of the intestine

which are interfering with nutrition should be operated on, even when there is pulmonary disease, provided that the intestinal lesions are not too advanced; this particularly applies to stenosis and abscess.

In the case of patients suffering from *Bright's Disease* it is well to follow the rule that when the condition for which operation is required is more menacing to life than the nephritis, operation should be undertaken; when this is not so it is well to abstain. Conditions such as rapidly growing malignant disease, intestinal stenosis, appendicitis, and such like, will be operated on in spite of nephritis; while benign tumours, malformations, and other conditions of this type will be left alone. Chloroform should never be given to a patient with Bright's disease.

In the case of patients with *Leucæmia* or *Pseudoleucæmia* only operations whose indication is vital should be undertaken. The risks are, first, post-operative hæmorrhage, and secondly, delay in healing of wounds. Extirpation of the spleen or of pseudoleucæmic glands are irrational procedures, and should not be practised.

It is sometimes necessary to operate on *Hæmophilics*, and cases are on record where the arrest of hæmorrhage has not presented the difficulties anticipated. No operation will, however, be done that is not absolutely of vital importance. Calcium chloride should be administered beforehand in order to aid local hæmostasis.

Operations have many times been performed on patients suffering from *chronic diseases of the spinal cord:* tabes, syringomyelia, etc. In addition to the cases operated on in error (e.g., laparotomy for gastric crises diagnosed as gastric ulcer) a considerable number of cases of nervous arthropathy have been operated on. The results are not uniform, but it appears that if strict asepsis is practised the wounds heal quite satisfactorily.

IMPORTANT COMPLICATIONS AFTER OPERATION.

Pneumonia is sometimes embolic (particularly in operations on the intestines), sometimes hypostatic, sometimes due to aspiration of vomited matter into the air passages,

and sometimes induced by chill during the course of the operation. Except for the embolic form the complication is one that can be avoided by due precautions. The treatment is the same as in pneumonia of ordinary type : support the heart, give stimulants, then expectorants. Fever and rapid respiration after operation will always indicate careful examination of the chest.

Among intestinal complications attention has recently been drawn to the occasional occurrence of obstinate and sometimes fatal *Diarrhœa* after gastro-enterostomy, but this is very rare. *Peptic Ulcer* is another complication which may follow this operation, but it also is quite uncommon. The possibility of its occurrence should be borne in mind especially in cases where hyperchlorhydria is demonstrated before operation. In such cases alkalies should be given after operation and the diet regulated with much care.

Stomach Paralysis is an accident which may follow anæsthesia for operations of any kind. The signs are uncontrollable vomiting, at first of bilious matter and later of blood, and marked distension of the stomach. Sometimes the condition has a mechanical cause, such as kinking at the duodenojejunal junction, but in most cases it is a condition of primary paralysis and dilatation. In marked cases death is not unusual.

Intestinal Paralysis occurs after abdominal operations. When at all marked, peritonitis will always be suspected. Probably most of the mild cases are examples of slight peritonitis, though direct trauma by handling, etc., is no doubt also sometimes responsible. If a purgative and enema do not relieve the symptoms within the course of twenty-four hours or so, there is probably either peritonitis or some mechanical obstruction of the bowel.

The *Pulse* usually returns to normal during the twenty-four hours which follow the operation ; in some patients about the age of puberty, and in some women and infants, there is tachycardia for several days later without any definite cause.

The *Temperature* is always carefully watched after operation. A normal temperature does not of course mean that all is well, nor fever that there is some serious complication. The temperature is always to be compared with the other

symptoms, and particularly with the pulse. A rising temperature and a rapid pulse usually mean some inflammatory complication. Special attention should be given to the comparison of temperature and pulse, particularly after abdominal operations; while a rise of temperature and pulse together point to infection, in the worst cases the temperature is often normal or subnormal and the pulse rapid. It is when the pulse and temperature part company that the most serious complications are to be feared.

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